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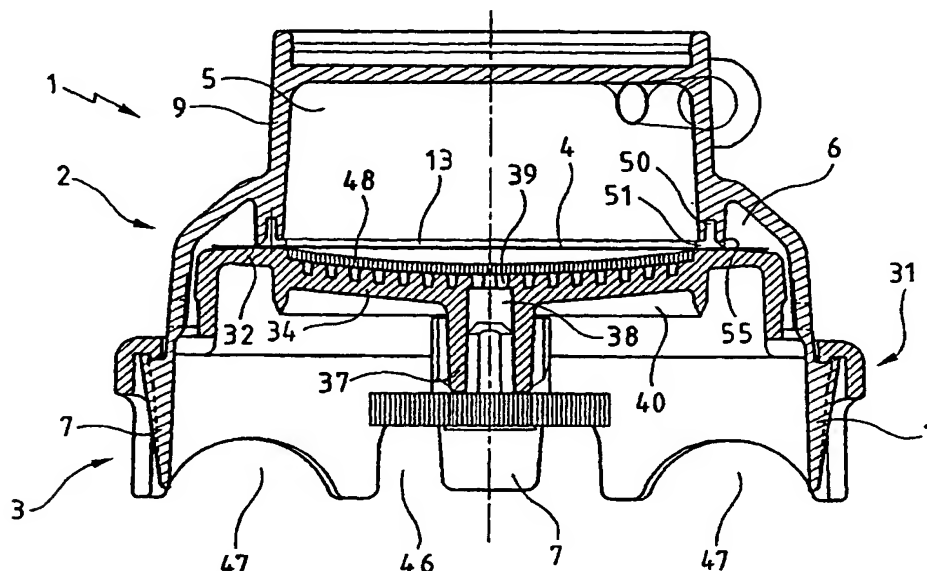
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(54) Title: DEVICE FOR MICROBIOLOGICAL EXAMINATION OF A SAMPLE OF LIQUID UNDER PRESSURE AND METHOD FOR DRAINING THIS DEVICE



(57) Abstract: This concerns a device whose filtering membrane (4) is gripped annularly at the periphery between a first member (9) forming part of an intake body (2) and a second member (32) forming part of a drainage body (3) with one out of the first member and second member having an elastomer seal (13) by means of which it comes into contact with the membrane (4), and whose locking means (7, 31) are adapted to allow the opening of the device by requiring only a separation movement between said first member (9) and said second member (32). The drainage method proposes directly placing the device on a vacuum flask, the sealing with regard to the stopper of said flask being obtained by a rib (40) tapering towards its end.

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5                   "Device for microbiological examination of a sample of liquid under  
pressure and method for draining this device"

10           The invention relates to the devices for microbiological examination  
of a sample of liquid under pressure.

15           Such a device is already known through French patent 2 677 664,  
having an intake body, a filtering membrane and a drainage body. The intake  
body has a reservoir, in one wall of which a liquid input aperture is made, the  
membrane closing this reservoir by being welded on to the edge of the lateral  
15 wall of this reservoir, the drainage body being designed to support the  
membrane on the opposite side from the reservoir and being provided with a  
liquid output aperture, the intake body and the drainage body locking with one  
another by screwing by virtue of integrally moulded thread elements.

20           The taking of a sample to be examined is performed by connecting  
the input aperture of the reservoir of the intake body to a source of liquid under  
pressure, so that the reservoir fills with this liquid, which can leave therefrom  
only through the filtering membrane, this liquid being recovered from the other  
side of the membrane by the drainage body and emptied therefrom through the  
output aperture.

25           In order to avoid the liquid which has passed through the membrane  
escaping from the drainage body somewhere other than through the output  
aperture, the intake body has, around the membrane, a flange provided with a  
lip coming to rest on the drainage body in order to obtain the required sealing.

30           This makes it possibly notably, for example by collecting the liquid  
emptied through the output aperture in a graduated container, to know  
accurately the volume of the sample of liquid which has passed through the  
membrane.

The invention relates to a device of the same kind, but simpler, more convenient and more economical, both in manufacture and in use.

To that end it proposes a device for microbiological examination of a sample of liquid under pressure, having an intake body, a filtering membrane and a drainage body, said intake body having a reservoir, in one wall of which a liquid input aperture is made, said membrane closing said reservoir, said drainage body having means of supporting said membrane on the opposite side from said reservoir and a liquid output aperture, said intake body and said drainage body having integrally moulded mutual locking means; characterised in that said membrane is gripped annularly at the periphery between a first member forming part of said intake body and a second member forming part of said drainage body with one out of said first member and said second member having an elastomer seal by means of which it comes into contact with said membrane, and in that said locking means are adapted to allow the opening of said device by requiring only a separation movement between said first member and said second member.

Thus, unlike the aforementioned earlier device, where the locking means are constituted by thread elements, the opening of the device according to the invention is performed with no rotational movement between the intake body and the drainage body.

The device according to the invention therefore makes it possible to eliminate any risk of creasing the membrane at the time of opening the device where it is then in the wet state.

Furthermore, the elastomer seal, although it is present only on one of the faces of the membrane, makes it possible to obtain sealing on both faces of the membrane, that is to say both with the first member and with the second member, from the simple fact that said members grip the membrane, that is to say they are held close to one another, so that it is not necessary, in order to close the device according to the invention, to perform a rotational movement, unlike the above-mentioned earlier device which requires, so that the sealing lip on the intake body is applied with the required intensity on the drainage body, that assembly is carried out by screwing with a considerable torque.

The device according to the invention is therefore much simpler and more convenient to use than the above-mentioned earlier device, and is furthermore simpler to manufacture, since there is no need, on the one hand, to make provision for achieving sealing between the membrane and the intake body by welding, and, on the other hand, sealing around the membrane between the intake body and the drainage body, given that, in the device according to the invention, the gripping of the membrane between the first member and the second member makes it possible to obtain these two instances of sealing directly.

Preferably, the membrane is held exclusively on account of it being gripped annularly at the periphery between said first member and said second member.

The manufacture and use of the device according to the invention are thus particularly simple, since no operation such as the sealing of the membrane existing in the earlier device has to be implemented, while, after opening of the device according to the invention, the membrane, which is fixed neither to the first member nor to the second member, can be recovered directly, for example with sterile tweezers in order to be put into culture in a conventional Petri dish.

According to other preferred characteristics, said locking means have means of axial latching between the intake body and the drainage body.

The assembly of the device according to the invention is thus particularly simple, since it is sufficient to bring the intake body and the drainage body together in order to lock them by latching.

It should be noted that the elastomer seal, on account of its elasticity, takes up the play necessary for enabling latching, so that, once assembled, the intake body and the drainage body are held with no axial play with respect to one another.

Preferably, for reasons of simplicity and convenience, both in manufacture and in use, one out of said intake body and said drainage body has at least one axially oriented latching tab while the other has means of receiving said latching tab.



Preferably again, said latching tab is connected to the remainder of that one out of said intake body and said drainage body which includes it, by a breakable zone.

5 The release of the locking means between the latching body and the drainage body can thus be performed by simple breaking of the latching tab, or even of a number of latching tabs if the device according to the invention has more than one.

According to other preferred characteristics, said drainage body has a circular table provided at its centre with means of supporting said membrane and having, around said support means, a wall having a surface situated facing  
10 said elastomer seal, which forms part of said intake body, said membrane being squeezed between said surface and said seal.

This arrangement offers in effect the advantage of being relatively simple to implement and of obtaining excellent results as regards sealing.

15 According to other preferred characteristics, for the same reasons, said output aperture of the drainage body is in the continuation of the internal passage of an output pipe disposed coaxially.

Preferably, said drainage body has, around said output pipe, an annular rib tapering towards its end.

20 This rib makes it possible in particular to drain the device according to the invention by placing it directly on a vacuum flask with said output pipe engaged in the central hole of the stopper of said flask and said annular rib resting on this stopper.

The invention also relates, in a second aspect, to a method for thus  
25 draining the device according to the invention.

The explanation of the invention will now be continued with the description of an example embodiment, given below as a non-limitative illustration, with reference to the accompanying drawings. In these:

- Figure 1 is an elevational view of a device in accordance with the  
30 invention;
- Figure 2 is a sectional elevational view of this device;

- Figures 3 and 4 are similar views but showing, respectively, only the intake body and the drainage body;

- Figure 5 is an enlargement of the part of Figure 2 situated at the bottom right;

5       - Figure 6 is a partial sectional elevational view of the seal with which the intake body is provided;

- Figure 7 is a sectional elevational view showing how the device according to the invention is used for sampling the liquid to be examined;

10       - Figure 8 is a similar view showing how the device in accordance with the invention is drained, after a sample has been taken, by means of a syringe;

- Figure 9 is the corresponding top view, a second possible location for the syringe being shown with a syringe partially illustrated;

15       - Figure 10 is a view similar to Figure 8, where the drainage is performed with a vacuum flask;

- Figures 11 and 12 are sectional elevational views showing how the latching tabs are broken off the intake body in order to release the latter from the drainage body;

20       - Figure 13 shows how the membrane is recovered with tweezers after this release; and

- Figure 14 shows how the membrane is deposited in a Petri dish.

25       The device 1 for microbiological examination of a sample of liquid under pressure shown in the drawings, and notably in Figures 1 and 2, has in general terms a symmetry of revolution around a central axis. It has an intake body 2, a drainage body 3 and a filtering membrane 4.

The intake body 2 has a reservoir 5, a skirt 6 which is connected externally to the reservoir 5 and four latching tabs 7 which extend projecting from the skirt 6, in an axial direction.

The reservoir 5 has an end wall 8 and a lateral wall 9.

30       Two diametrically opposite pipes 10 extend projecting outward from the lateral wall 9, above the skirt 6, each of these pipes constituting a female Luer connector adapted to receive internally a male Luer connector, as will be

explained below with the help of Figure 7, the passage internal to each pipe 10 being continued by an aperture 11 made in the wall 9, this aperture being in immediate proximity to the end wall 8.

5 The lateral wall 9 finishes at the end opposite the end wall 8 in an edge forming part of a seal 13, a groove 14 being made to that effect in the rigid part of the wall 9, as will be explained in more detail subsequently with the help of Figures 2, 3 and 6.

10 The skirt 6 is connected to the reservoir 5 by the outside of the lateral wall 9, at a level situated between the groove 14 and the pipes 10, the skirt 6 having a truncated-cone shaped wall 15 and a cylindrical wall 16, the skirt 6 being connected to the wall 9 by the small-diameter end of the wall 15 while the connection between the walls 15 and 16 is made by the large-diameter end of the wall 15, the connection between the walls 15 and 16 being situated approximately at the level of the edge of the wall 9.

15 Each of the latching tabs 7 has a general outline in the form of a trapezium symmetrical with respect to the axial direction, the side forming the free end 18 of the tab 7 being parallel to the one by which this tab is connected to the skirt 6, and more precisely to the edge of the wall 16, the tab 7 narrowing steadily between its connection to the skirt 6 and its free end.

20 On either side of each tab 7, a notch 17 is made in the wall 16, over a certain distance from the edge thereof.

Each tab 7 has, from its free end 18, an internal surface 19 which is straight, that is to say parallel to the axial direction, as far as a dihedral 20 from which the surface 19 is inclined inward and towards the wall 16.

25 As for the external surface 21 of each tab 16, this is inclined outward and towards the wall 16, the surface 21 extending between the surface 18 and a transversely oriented surface 22 which connects the surface 21 and a groove 23 situated between an external shoulder 24 whose surface 22 constitutes the edge and a surface 25 offset inward with respect to the surface 21, the surface 30 25 being in the continuation of the external surface of the wall 16.

It should be noted that the portion of each tab 7 situated between the bottom of the groove 23 and the edge of the wall 16 has a thickness which is a minimum at the level of the dihedral 20.

Consequently, it is in the region of the dihedral 20 that the tab 7  
5 breaks if a sufficiently large pressure is exerted on the surface 21, and more generally if there is exerted on the tab 7 a radial force directed inward, the force necessary for breaking the tab 7 being smaller the closer it is applied to the end surface 18.

As can be seen more particularly in Figure 1, the surface 21 has  
10 edges parallel to the axial direction, each tab 7 having a notch 26 with an L-shaped profile between the lateral edges of the surface 21 and the lateral edges of the tab 7.

As can be seen better in Figure 4, the drainage body 3 has a circular  
table 30 and a skirt 31 disposed in a step around the table 30.

15 The latter has an annular transverse wall 32 delimited on the opposite side from the skirt 31 by a surface 33 which is flat in the main but having a slight bevel towards the outside.

The internal periphery of the wall 32 is connected to a wall 34  
20 delimited, on the side of the surface 33, by a surface 35 which is concave in the main, offset with respect to the surface 32 in the axial direction, towards the skirt 31, the perimeter of the surface 35 and the internal periphery of the surface 33 being connected by a slightly truncated-cone shaped surface 36.

The wall 34 is connected centrally to a pipe 37 whose internal  
25 passage is extended into the wall 34 by an output aperture 38, concentric drainage channels 39 being put into the wall 34 from the surface 35, radially oriented channels (not visible in the drawings) also being made, with the same depth as the channels 39, these radial channels opening of course into the output aperture 38, through which, therefore, there flows out all the liquid drained by the channels made in the wall 34 hollowed out with respect to the  
30 surface 35.

At the junction between the walls 32 and 34 there is situated an  
annular rib 40 which projects with respect to the walls 32 and 34 on the side of

the skirt 31, this rib tapering towards its free end in a V-shaped profile, so that this end constitutes a sharp edge.

The table 30 also has a tubular lateral wall 41 which is connected by one end to the wall 32 while, by the other end, it is connected to the skirt 31.

5       The latter has a transversely oriented annular wall 42 and an axially oriented cylindrical wall 43, the wall 42 being connected by one of its ends to the wall 41 and by the other to the wall 43.

10       In the wall 42, in proximity to the wall 41, four openings 44 are made, which have between them the same angular spacing as between the latching tabs 7, that is to say they are spaced out from one another by 90°, these openings having an outline corresponding to the largest outline of the tabs 7, so that the latter can each pass through a respective opening 44.

Each opening 44 is bordered on the external side by an axially oriented tooth 45 projecting on the opposite side from the table 30.

15       Each tooth 45 extends projecting over a height corresponding to the depth of the groove 23 and has a thickness less than the width of the groove 23, the distance separating each tooth 45 from the wall 43 being greater than the thickness of the shoulder 24 (see Figure 5).

20       At the level of each opening 44, the wall 43 has a notch 46 of general rectangular form with rounded corners, extending over approximately two thirds of the height of the wall 43 and over a width which is approximately twice the width of the latching tabs 7.

25       The wall 43 also has four notches 47, each disposed halfway between two successive notches 46, the notches 47 having a rounded form whose maximum height corresponds approximately to one third of the height of the wall 43.

30       The drainage body 3 also has a porous pad 48 (not depicted in Figure 4), which has a constant thickness with two opposite surfaces of the same form as the surface 35, its diameter and thickness being the same as those of the surface 36.

When the filtration body 2, the drainage body 3 and the membrane 4 are assembled, as shown notably in Figures 1 and 2, the membrane 4 is

gripped between the edge of the lateral wall 9 of the reservoir 5 of the intake body 2 and the surface 33 of the wall 32 of the circular table 30 of the drainage body 3, the bodies 2 and 3 being locked to one another by virtue of the latching tabs 7 and the skirt 31, which are mutually disposed as can be seen more particularly in Figure 5.

It should be noted that the tooth 45 of the wall 42 fits into the groove 23 of the tab 7 and that the shoulder 24 of this tab fits into the space situated between the wall 43 and the tooth 45, so that the cooperation between the shoulder 24 and the tooth 45 provides an extremely powerful locking of the tab 7 in the skirt 31, capable of withstanding relatively large forces tending to move the bodies 2 and 3 away from one another.

It should also be noted that the end 18 of the tab 7 is recessed with respect to the free end of the wall 43, so that, when the device 1 is put down on a surface with the drainage body 3 at the bottom, it is by means of the skirt 31 thereof that the device 1 rests on this surface, no force being exerted for this reason on the tabs 7, which therefore do not risk being broken accidentally.

As can be seen in Figure 2, when the device 1 is assembled, the seal 13, and more particularly the cushion thereof, is highly compressed compared with the off-load form of this seal shown in Figure 6.

As indicated above, this seal has a T-shaped general profile whose longitudinal branch forms a rib 50 designed to be inserted into the groove 14 and whose transverse branch forms a cushion 51 designed to enter into contact with the membrane 4.

The free end of the cushion 51 has a central slot 52 which makes it possible to release two annular lips 53 allowing the best cooperation of the cushion 51 with the membrane 4.

It should be noted that the junction between the rib 50 and the cushion 51 is made by a straight surface on the internal side while, on the external side, there is a bevel 54.

This bevel in fact corresponds to a chamfered lip 55 at the external periphery of the end of the rigid part of the wall 9, this chamfered lip making it possible to laterally contain the cushion 51 on the external side in order that it

flows mainly inward, that is to say towards the chamber delimited by the membrane 4 and the reservoir 5.

5 The intake body 2 is obtained, with the exception of the seal 13, by moulding of a relatively rigid and transparent plastic, and then there is moulded, on to this piece, the seal 13, which is made of elastomer, this over-moulding being carried out in the example illustrated by bi-injection.

The part of the drainage body 3 depicted in Figure 4 is also made of relatively rigid moulded plastic, here white in colour, this part being next equipped, by simple fitting, with the porous pad 48.

10 In order to assemble the intake body 1, the drainage body 3 and the membrane 4, the latter is put on the table 30, concentrically therewith, then the intake body 2 is positioned facing the drainage body 3 with the latching tabs 7 aligned with the openings 44, then the body 2 is pressed hard towards the body 3 so that the tabs 7 engage in the openings 44 flexing slightly by virtue of the inclined surface 21 which acts as a ramp, the force exerted allowing the surface 15 22 of the shoulder 24 to get over the tooth 45 at the end of the pushing in movement, by virtue of the spring of the tabs 7, the seal 13 next relaxing slightly so that the play between the tabs 7 and the skirt 31 is completely taken up, the elasticity of the seal 13, which is then compressed, maintaining the locking thus 20 obtained.

It should be noted that the maintaining of the seal in the compressed state allows it to offer excellent sealing between the membrane 4 and the edge of the wall 9, and furthermore, by reaction, between the membrane 4 and the surface 33.

25 It should also be noted that the internal surface of the wall 16 has localized areas of extra thickness 27 (Figure 3) coming into contact with the external surface of the wall 41, which provides a lateral wedging between these surfaces, which are of similar diameter, and more generally between the bodies 2 and 3.

30 Finally it should be noted that, once the device 1 has been assembled in this way, it is possible to package it and sterilize it with a gas such as ETO or by irradiation.

Of course, before packaging the assembled device 1 and sterilizing it, each of the pipes 10 and 37 is equipped with a stopper.

There will now be explained how the sampling of a liquid under pressure is carried out with the device 1.

5 First of all the stopper blocking off one of the pipes 10 and the stopper blocking off the pipe 37 are removed, then the unstoppered pipe 10 is connected to a source of liquid under pressure, for example using, as shown in Figure 7, a sampling connector 60 having a male Luer tip 61, which is inserted into the passage of the unstoppered pipe 10 and the valve 62 of the connector  
10 60 is manipulated, so that the chamber formed by the reservoir 5 and the membrane 4 is raised to the same pressure as the liquid, for example 3 bars, the liquid entering the reservoir 5 through the aperture 11 and leaving the reservoir by passing through the membrane 4, which comes to rest on the porous pad 48, the liquid which has passed through the membrane 4 being  
15 guided by the channels 39 to the aperture 38, the liquid leaving the device 1 by the pipe 37, a graduated container being preferably disposed under the device 1 in order to recover the liquid coming out of the pipe 37 in order to know when the volume required for the sample has passed through the membrane 4.

When this volume has been reached, the valve 62 is closed and the  
20 device 1 is removed from the connector 60, then there is put in place, in the unstoppered pipe 10, an air sterilization filter 63 (depicted in Figure 10 but not in Figure 8), and the drainage of the liquid still present notably in the reservoir 5 is next carried out, by suction through the output aperture 38.

In the example shown in Figure 8, the drainage is performed with a  
25 syringe or pump 64 having a connector 65 provided with a suction tip 66 which has been inserted into the passage of the pipe 37, the liquid sucked out by the tip 66 being expelled by the tip 67 when the shaft 69 is pushed into the body 68, by pressing on the plunger 70.

It should be noted that the notches 47 made in the wall 43 make it  
30 possible to correctly position the pump or syringe 64 in relation to the device 1, in four positions at 90° from one another, two of these positions being shown in Figure 8.



Another possibility for extracting the liquid remaining in the device 1 after sampling, is to use a vacuum flask, as shown in Figure 10.

The vacuum flask 71 illustrated has a glass body 72 having, at the level of its neck, a pipe 73 connected, in a manner not depicted, to a vacuum pump, and, at the top of this neck, a flexible stopper 74 with a central aperture 75 made in it, the flask 71 being of a type which is commonly found in practice.

The device 1 is simply put down on the stopper 74, with the pipe 37 engaged in the aperture 75 and the rib 40 supported on the top of the stopper 74.

On account of the tapered profile of the rib 40, the latter locally deforms the stopper 74 and provides sealing which makes it possible to suck out the residual liquid, as drawn.

Once the liquid remaining in the device 1 has been emptied therefrom, the device 1 can be opened, which is performed by breaking the four latching tabs 7, by simple pressure on said tabs through the respective notches 46, as explained above and illustrated in Figures 11 and 12.

It is then possible to remove the intake body 2 from the drainage body 3 and pick up the membrane 4, for example with sterile tweezers 80, as shown in Figure 13, then deposit the membrane through which the sample to be examined has passed, in a Petri dish 81, as shown in Figure 14, then carry out conventionally the incubation of the membrane/Petri dish assembly.

It should be noted that the concavity of the surface 35 has been calculated so that the ratio of the difference between the length of the arc corresponding to the profile, in a diametral plane, of the surface of the pad 48 facing the membrane 4 and between the length of the chord of this arc, over the latter length, corresponds to the coefficient of expansion of the membrane 4 between the dry state and the wet state.

The result thereof is that the expansion of the membrane 4, when it changes from the dry state to the wet state, corresponds precisely to the difference in length between the arc corresponding to the above-mentioned profile and the chord of this arc, so that, in the wet state, the membrane 4 rests perfectly on the pad 48, with no creases. The pad 48 therefore provides a

particularly effective support for the membrane 4 when it is subjected to the difference in pressure which allows the liquid to flow through it.

Moreover, when the user recovers the membrane 4 with the tweezers 80 as shown in Figure 13, this membrane has a concave form, on the side where the reservoir 5 is situated, that is to say on the side where any micro-organisms retained by the membrane at the time of sampling are present, the curvature of the membrane 4 thus being in the correct direction where putting it down on the surface of the culture medium 82 in the dish 81 is concerned.

This is because, when the membrane 4 is positioned on the dish 81, it is the convex side of the membrane 4 which faces the surface of the medium 82, so that, putting down the membrane 4 on the medium 82 from a portion of the membrane opposite the tweezers 80 and moving them so that the membrane progressively comes into contact with the medium 82 to the place where it is held by the tweezers. The risk that the membrane has one or more hollows on the opposite side from the medium 82, and therefore the risk that it develops one or more pocket(s) of air between the membrane 4 and the medium 82, are thus zero or at any rate minimal.

The culture medium 82 in the dish 81 illustrated in Figure 14 is a culture medium containing agar-agar, used in the solid state after having been poured into the dish hot.

If it is wished to use a liquid culture medium, it is possible to replace the Petri dish 81 with a similar dish but one where the agar-agar culture medium 82 is replaced by an absorbent pad impregnated with liquid culture medium.

Another possibility, rather than culturing the micro-organisms outside the device 1, is to inject liquid culture medium therein using one of the pipes 10, then to drain the excess culture medium using the pipe 37, and to next put the device 1 to incubate directly, the membrane 4 being recovered only in order to identify and count the micro-organisms after incubation.

In such a case, there is an advantage in using a liquid culture medium which is slightly more concentrated than the conventional media since

there always remains, notably in the pad 48, a certain amount of the sampled liquid which mixes with the injected culture medium which is therefore diluted.

In variants, not depicted, it is the drainage body 3, and not the intake body 2, which has the elastomer seal such as the seal 13 described above; the male and female latching elements between the bodies 2 and 3 are provided respectively on the drainage body 3 and the intake body 2, rather than the reverse; and/or use is made of latching means of different type, locking means having hinge means between the bodies 2 and 3 and latching means opposite the hinge means, or means of locking other than by latching.

Many other variants are possible depending on circumstances, and it should be stated in this respect that the invention is not limited to the examples described and depicted.

CLAIMS

1. Device for microbiological examination of a sample of liquid under pressure, having an intake body, a filtering membrane and a drainage body, said intake body having a reservoir, in one wall of which a liquid input aperture  
5 is made, said membrane closing said reservoir, said drainage body having means of supporting said membrane on the opposite side from said reservoir and a liquid output aperture, said intake body and said drainage body having integrally moulded mutual locking means; characterised in that said membrane (4) is gripped annularly at the periphery between a first member (9) forming part  
10 of said intake body (2) and a second member (32) forming part of said drainage body (3) with one out of said first member and said second member having an elastomer seal (13) by means of which it comes into contact with said membrane (4), and in that said locking means (7, 31) are adapted to allow the opening of said device by requiring only a separation movement between said  
15 first member (9) and said second member (32).

2. Device according to Claim 1, characterised in that the membrane (4) is held exclusively on account of it being gripped annularly at the periphery between said first member (9) and said second member (32).

3. Device according to either one of Claims 1 or 2, characterised in  
20 that said seal (13) is moulded on to that one out of said first member (9) and said second member (32) which includes it.

4. Device according to any one of Claims 1 to 3, characterised in that it is the first member (9) which has said elastomer seal (13).

5. Device according to Claim 4, characterised in that said first  
25 member (9) forms a lateral wall of said reservoir (5) of the intake body (2), said wall (9) finishing at one end in an edge forming part of said seal (13).

6. Device according to Claim 5, characterised in that a groove (14)  
is made at the end of a rigid part of said lateral wall (9) while said seal (13) has a T-shaped profile whose longitudinal branch forms a rib (50) inserted into said  
30 groove (14) and whose transverse branch forms a cushion (51) which is in contact with the membrane (4).

7. Device according to Claim 6, characterised in that there is a bevel (54) between the rib (50) and the cushion (51) on the external side, while, on the internal side, the rib (50) and the cushion (51) are connected by a straight surface.

5           8. Device according to either one of Claims 6 or 7, characterised in that said cushion (51) has two annular lips (53).

9. Device according to any one of Claims 1 to 8, characterised in that said locking means have means of axial latching (7, 31) between the intake body (2) and the drainage body (3).

10           10. Device according to Claim 9, characterised in that one out of said intake body (2) and said drainage body (3) has at least one axially oriented latching tab (7) while the other has means of receiving (42, 44, 45) said latching tab.

15           11. Device according to Claim 10, characterised in that said latching tab is connected to the remainder of that one out of said intake body (2) and said drainage body (3) which includes it, by a breakable zone.

12. Device according to Claim 11, characterised in that said breakable zone is situated in the region of a dihedral (20) in one of the surfaces (19) of said latching tab (7).

20           13. Device according to Claim 12, characterised in that said surface (19) having a dihedral (20) is situated on the internal side of the latching tab (7).

14. Device according to any one of Claims 10 to 13, characterised in that said latching tab (7) extends projecting from the edge of a skirt (6) forming part of that one out of said intake body (2) and said drainage body (3) which includes it.

25           15. Device according to Claim 14, characterised in that that one out of said intake body (2) and said drainage body (3) which has means of receiving said latching tab (7) has a wall (42) oriented transversely and provided with an opening (44) through which the latching tab (7) can pass, said tab and said wall (42) having means (23, 24, 45) for preventing the withdrawal of the tab (7) once  
30 it has been pushed right into the opening (44).

16. Device according to Claim 15, characterised in that said means for preventing the withdrawal of the latching tab (7) have, on said wall (42), a tooth (45) oriented axially and bordering said opening and having, on said latching tab, a groove (23) adapted to accommodate said tooth (45).

5           17. Device according to either one of Claims 15 or 16, characterised in that said transversely oriented wall (42) is connected to a lateral wall (43) extending on the opposite side from that one out of said intake body (2) and said drainage body (3) which has the latching tab (7), with the dimension in the axial direction of said lateral wall (43) being greater than the dimension in the  
10 axial direction of the latching tab (7).

18. Device according to Claim 17, characterised in that a notch (46) is made in said lateral wall (46) at the level of said opening (44), to make it possible to press on said latching tab (7).

15           19. Device according to any one of Claims 10 to 18, characterised in that it is the intake body (2) which has the latching tab (7), and in that it is the drainage body (3) which has the means of receiving (42, 44, 45) said latching tab (7).

20           20. Device according to any one of Claims 10 to 19, characterised in that one out of said intake body (2) and said drainage body (3) has a number of said latching tabs (7).

21. Device according to Claim 20, characterised in that it has four latching tabs (7).

22. Device according to any one of Claims 9 to 21, characterised in that said locking means comprise exclusively said axial latching means (7, 31).

25           23. Device according to any one of Claims 1 to 22, characterised in that said drainage body (3) has a circular table (30) provided at its centre with means of supporting (48) said membrane (4) and having, around said support means (48), a wall (32) having a surface (33) situated facing said elastomer seal (13), which forms part of said intake body (2), said membrane (4) being  
30 squeezed between said surface (33) and said seal (13).

24. Device according to Claim 23, characterised in that said support means (48) have a concave surface facing said membrane (4).

25. Device according to Claim 24, characterised in that the ratio of the difference between the length of the arc corresponding to the profile, in a diametral plane, of said surface of said support means (48) and between the length of the chord of this arc, over the latter length, corresponds to the coefficient of expansion of said membrane (4) between the dry state and the wet state.

26. Device according to any one of Claims 23 to 25, characterised in that said support means are formed by a porous pad (48).

27. Device according to Claim 26, characterised in that said drainage body (3) has drainage channels (39) under said porous pad (48), said drainage channels opening into said output aperture (38).

28. Device according to any one of Claims 23 to 27, characterised in that the external diameter of said circular table (30) corresponds substantially to the internal diameter of a skirt (6) included in said intake body (2), said skirt (6) encircling said circular table (30).

29. Device according to Claim 28, characterised in that areas of extra thickness for wedging (27) are provided between said circular table (30) and said skirt (6).

30. Device according to any one of Claims 23 to 29, characterised in that said drainage body has a skirt (31) disposed in a step with respect to said circular table (30).

31. Device according to Claim 30, characterised in that said skirt (31) has means of latching (42, 44, 45) with said intake body (2).

32. Device according to either one of Claims 30 or 31, characterised in that said skirt (31) of the drainage body (3) has at least one notch (47) adapted to allow the placing of a drainage syringe (64).

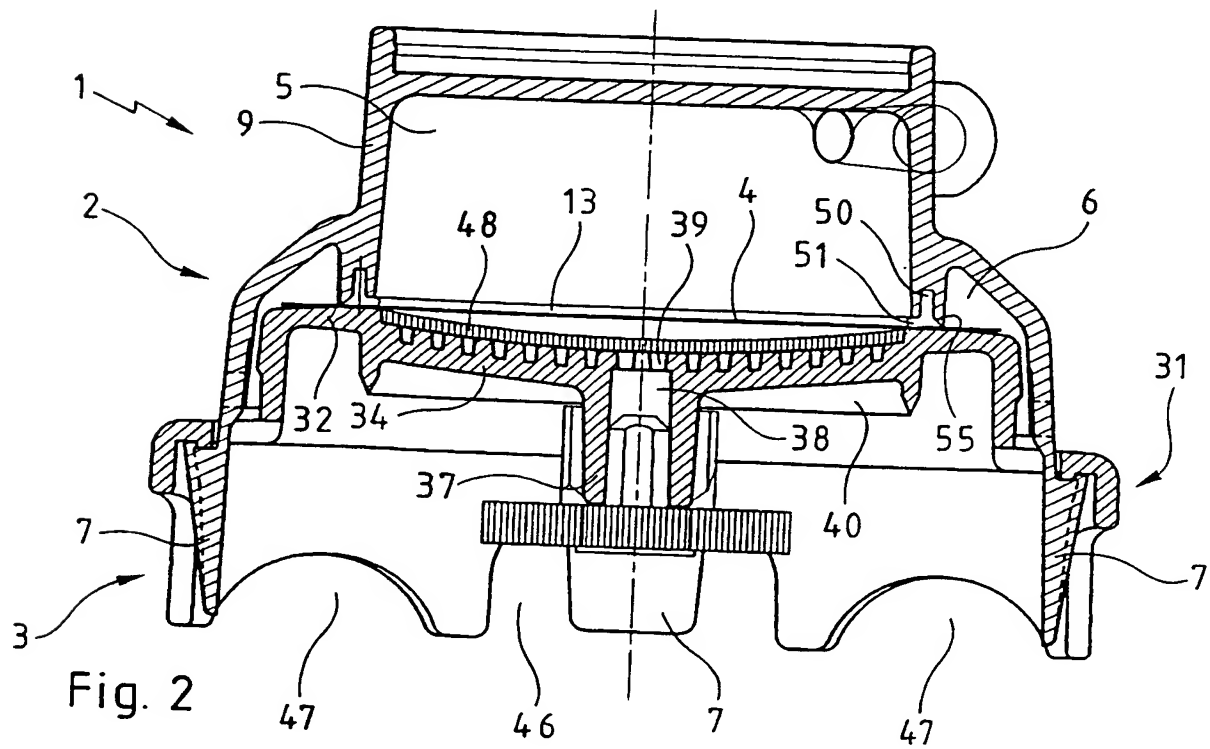
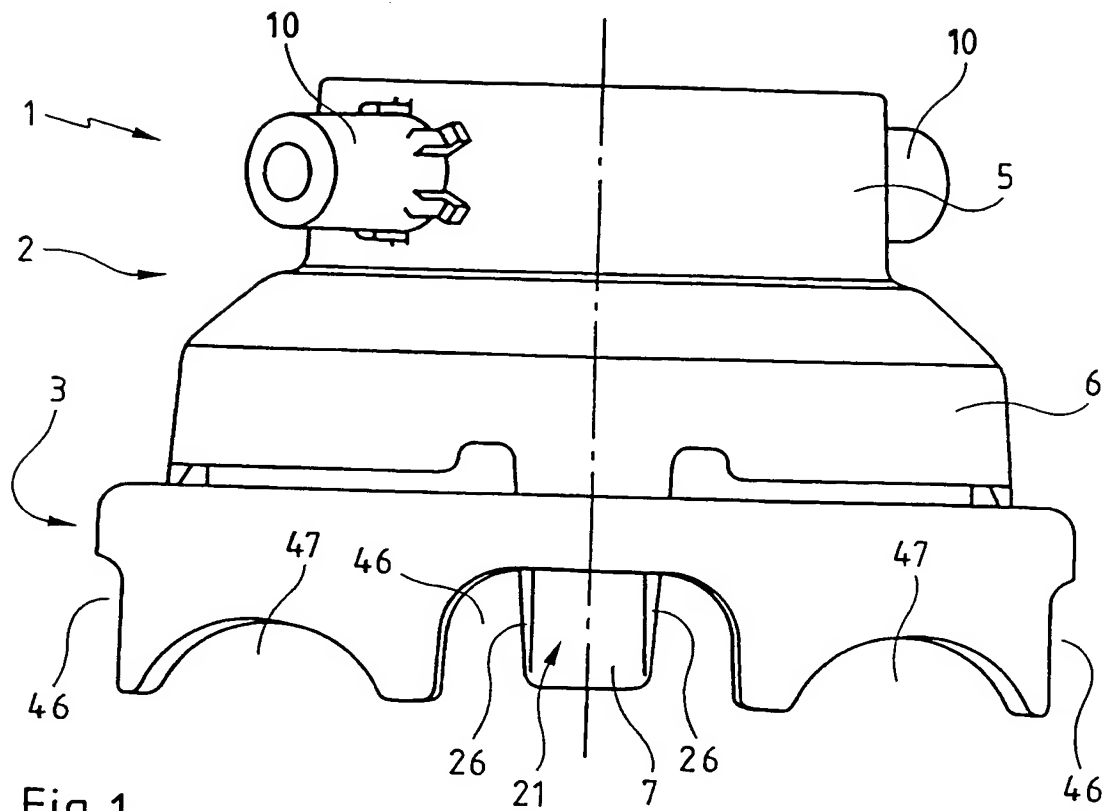
33. Device according to any one of Claims 1 to 32, characterised in that said output aperture (38) of the drainage body (3) is in the continuation of the internal passage of a coaxially disposed output pipe (37).

34. Device according to Claim 33, characterised in that said drainage body (3) has, around said output pipe (37), an annular rib (40) tapering towards its end.

35. Method for draining a device according to Claim 34, characterised in that it is placed on a vacuum flask (71) with said output pipe (37) engaged in the central hole (75) of the stopper (74) of said flask and said annular rib (40) resting on this stopper.



1/7





3/7

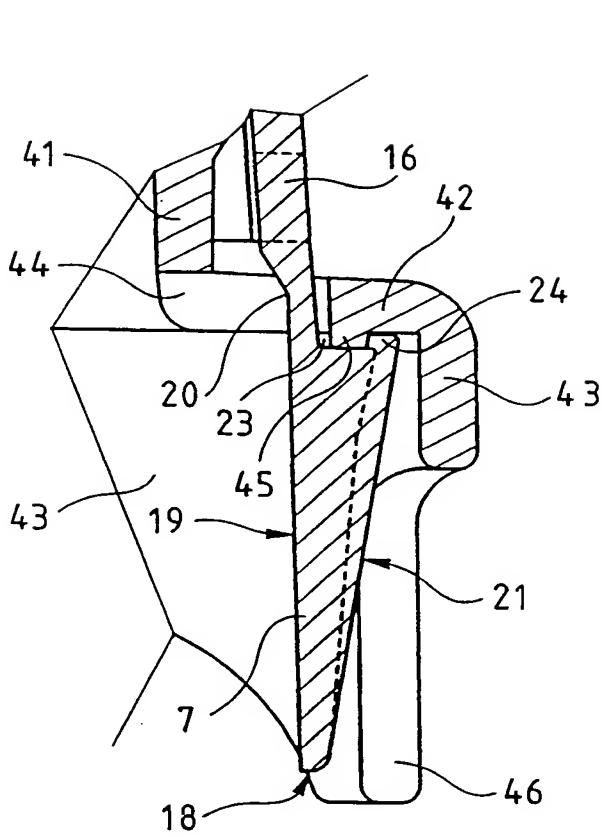


Fig. 5

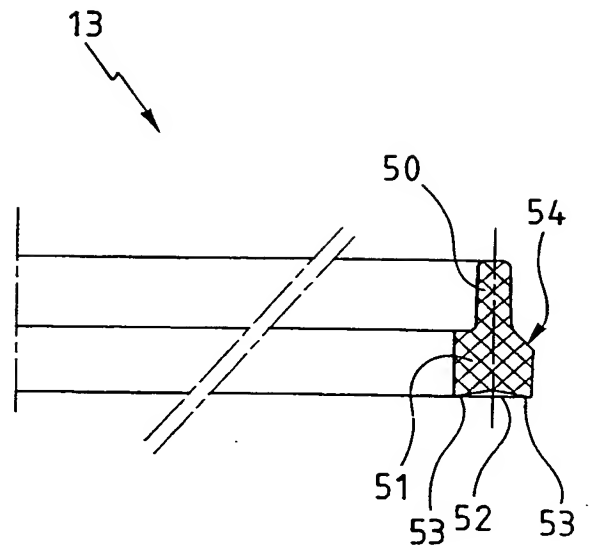


Fig. 6

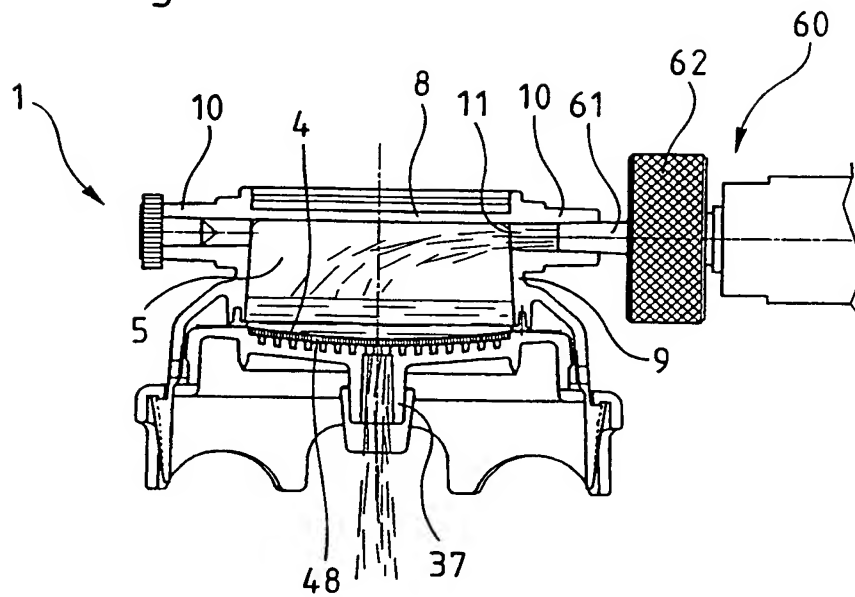


Fig. 7

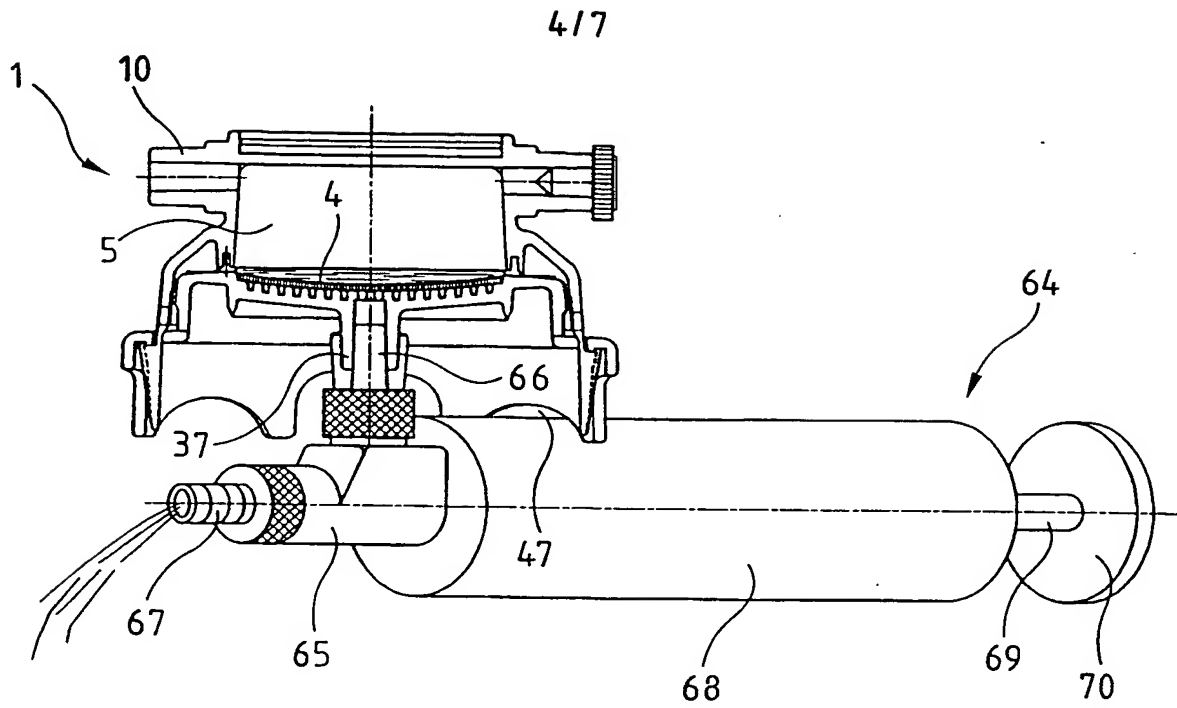


Fig. 8

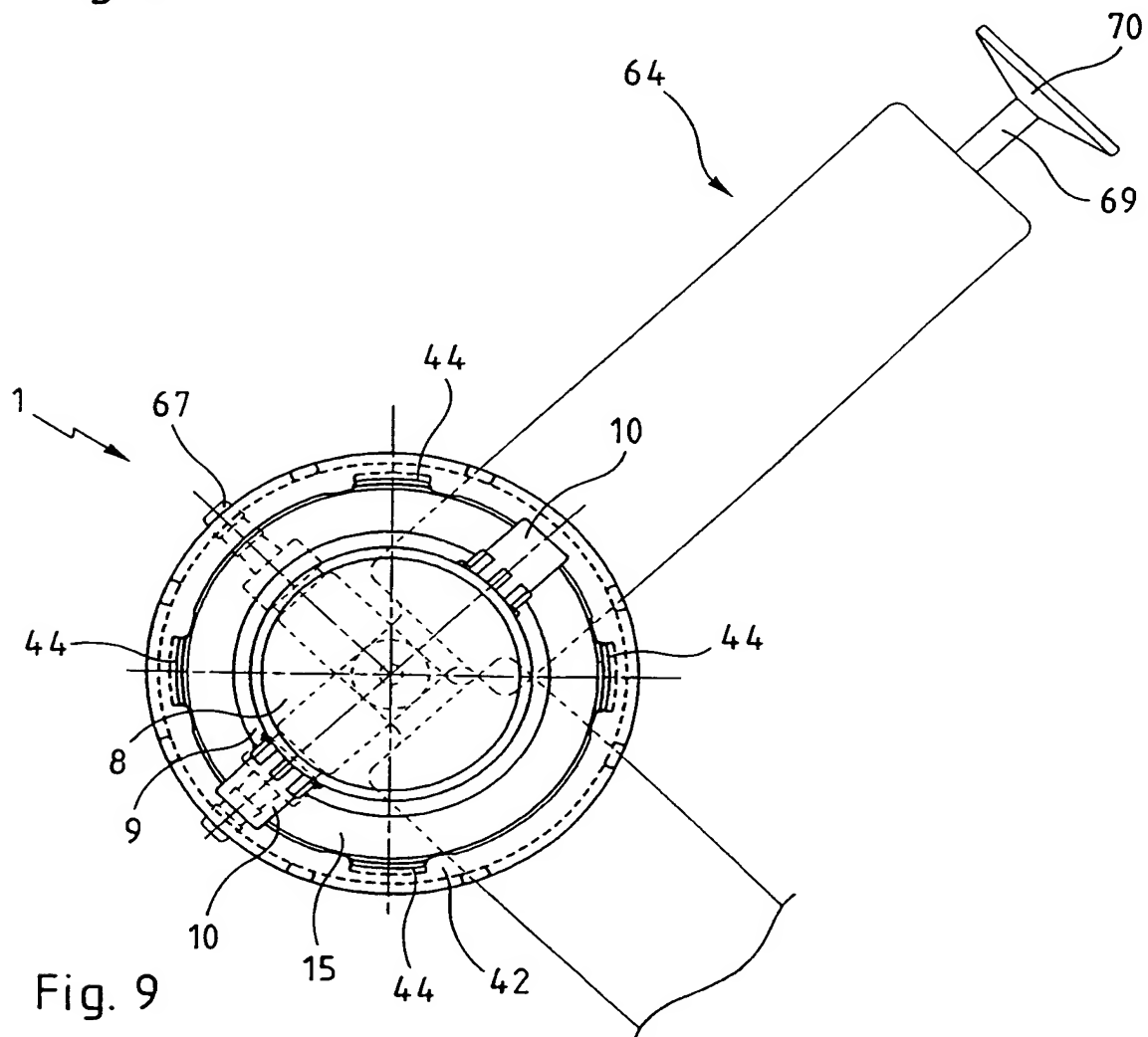


Fig. 9

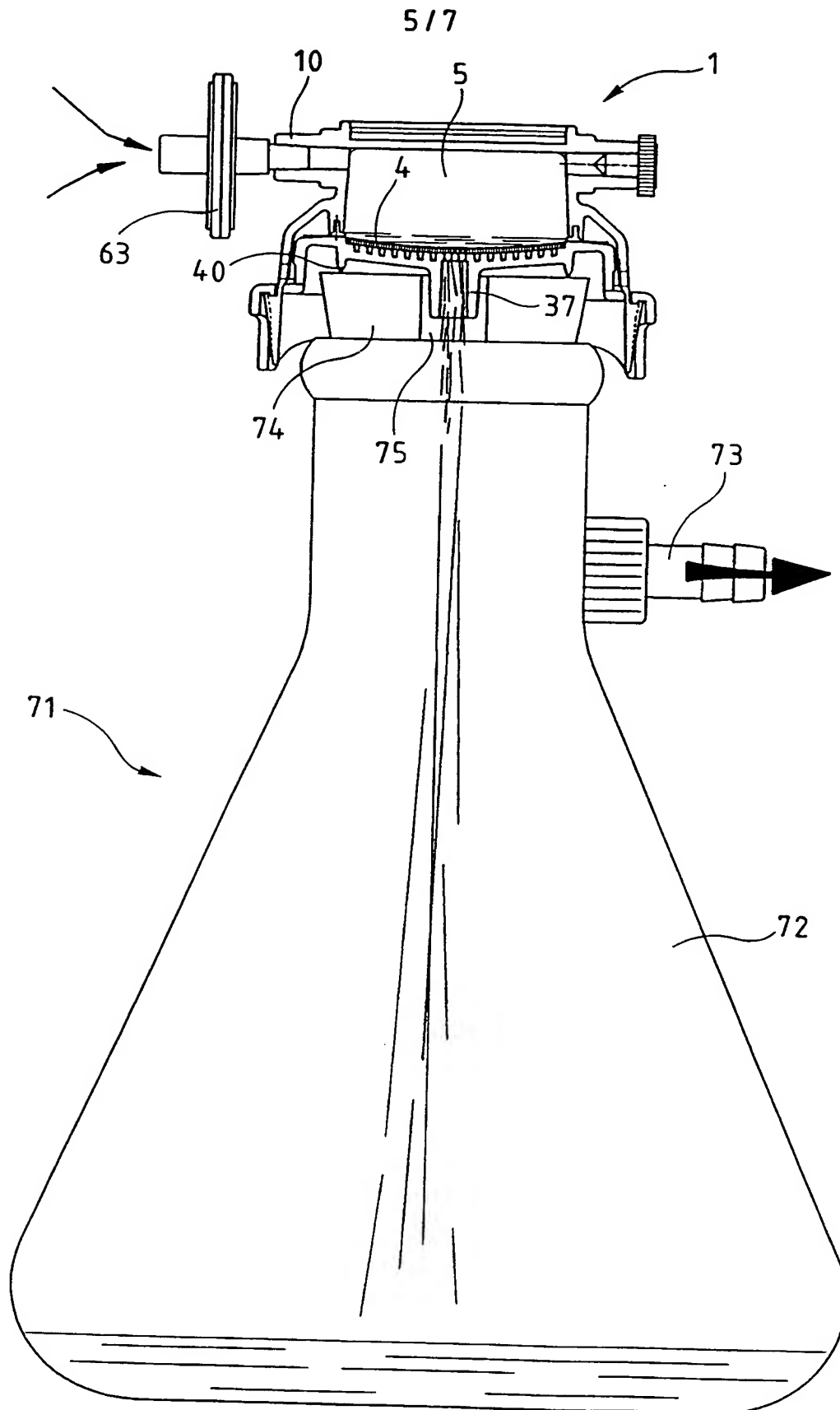


Fig. 10

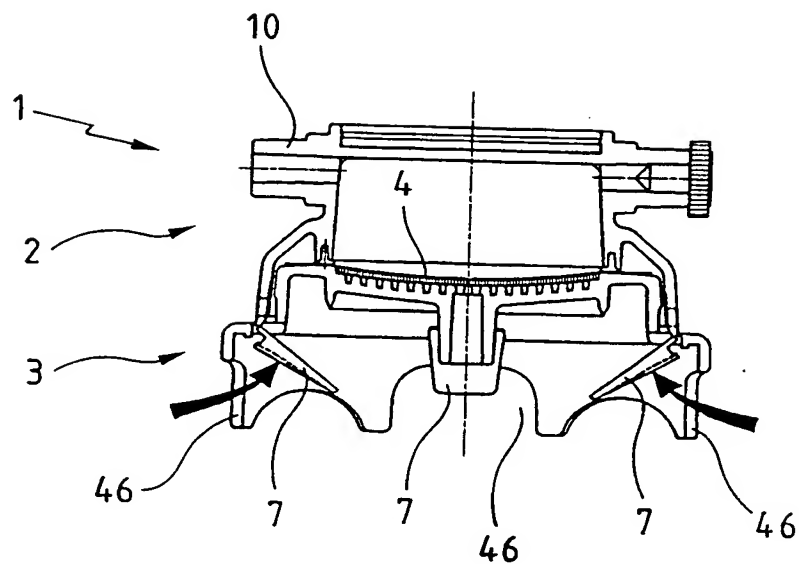


Fig. 11

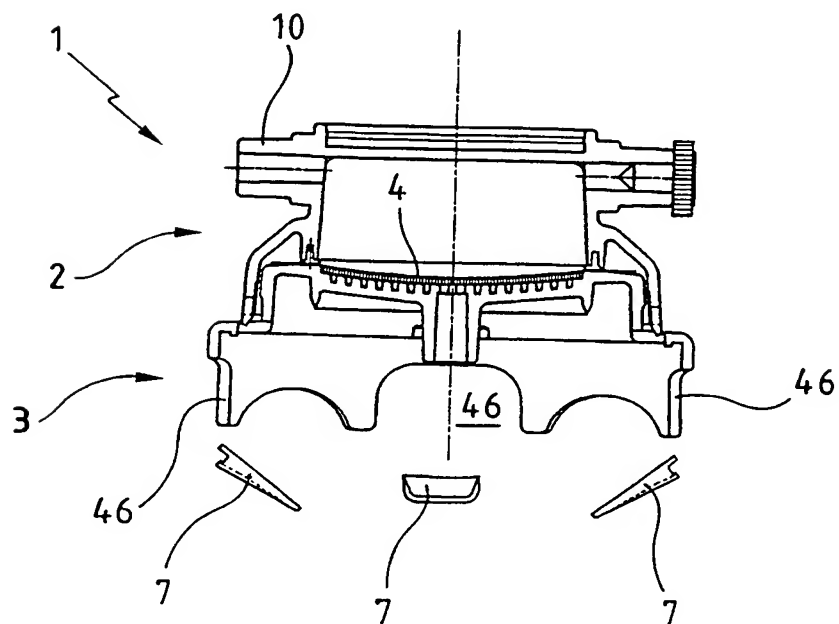
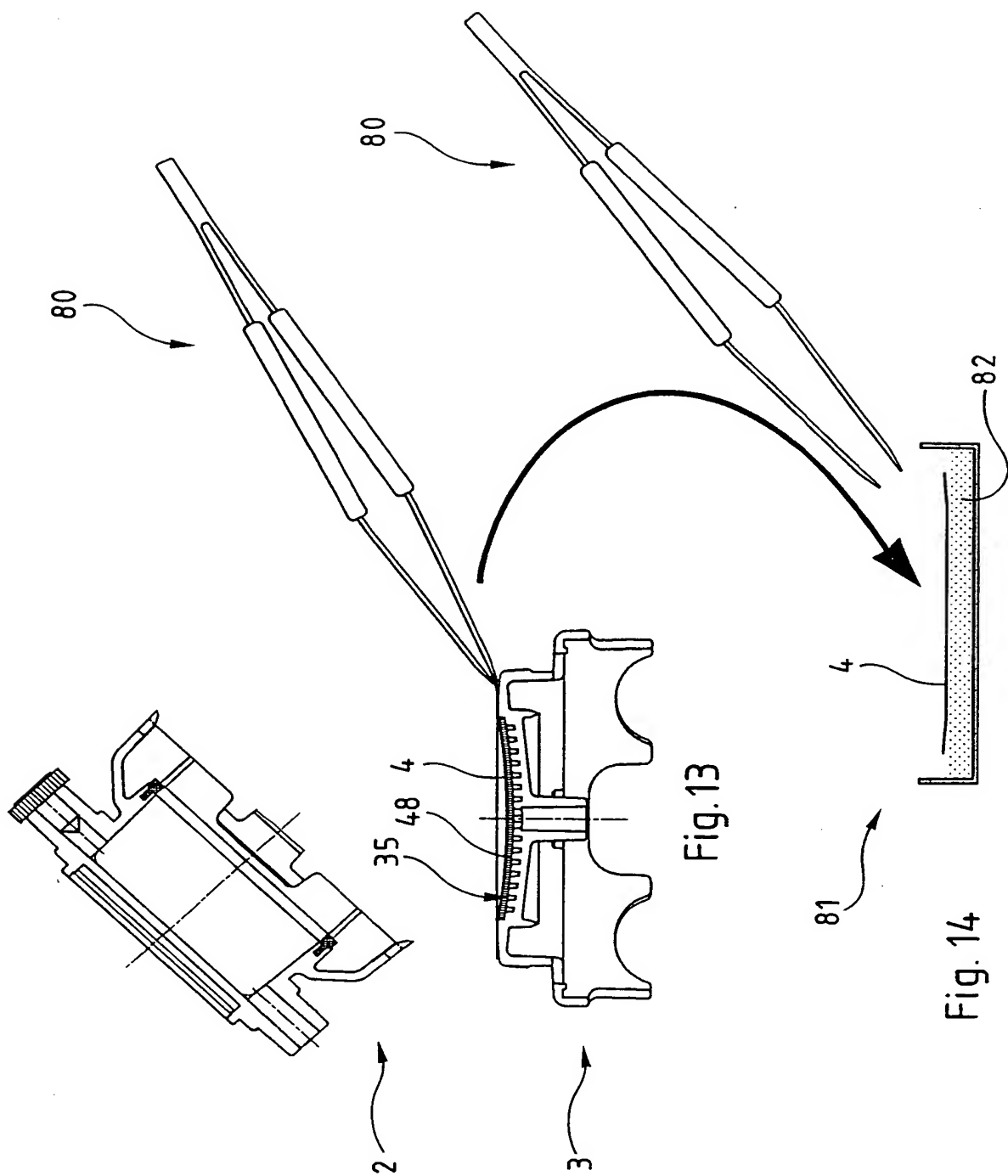


Fig. 12



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IB 00/01902

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0059809	A	15-09-1982	AU 541787 B	17-01-1985
			AU 7613881 A	09-09-1982
			CA 1176575 A	23-10-1984
			DE 3169275 D	18-04-1985
			JP 1326266 C	16-07-1986
			JP 57144013 A	06-09-1982
			JP 60049005 B	30-10-1985
			US 4614585 A	30-09-1986
US 4678576	A	07-07-1987	AU 553526 B	17-07-1986
			AU 8794682 A	24-03-1983
			CA 1198063 A	17-12-1985
			DE 3268134 D	06-02-1986
			EP 0075405 A	30-03-1983
			JP 1008295 B	13-02-1989
			JP 1526071 C	30-10-1989
			JP 58061439 A	12-04-1983
EP 0319701	A	14-06-1989	DE 3741388 C	30-03-1989
			JP 2002809 A	08-01-1990
US 4319996	A	16-03-1982	CA 1171365 A	24-07-1984
			FR 2493720 A	14-05-1982
			GB 2086752 A, B	19-05-1982
			JP 1256843 C	29-03-1985
			JP 57091711 A	08-06-1982
			JP 59033403 B	15-08-1984
US 5688460	A	18-11-1997	US 5556541 A	17-09-1996
			CA 2131359 A	27-10-1995
			EP 1016443 A	05-07-2000
			EP 0679490 A	02-11-1995
			JP 7289858 A	07-11-1995
US 5308483	A	03-05-1994	CA 2143421 A	17-03-1994
			EP 0656803 A	14-06-1995
			JP 8500527 T	23-01-1996
			WO 9405395 A	17-03-1994



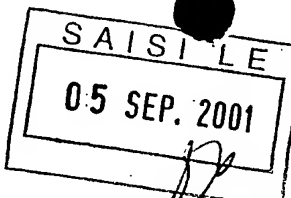
# PATENT COOPERATION TREATY

FL

From the:  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

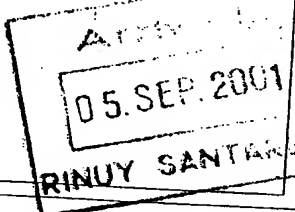
RINUUY, SANTARELLI  
14, avenue de la Grande Armée  
B.P. 237  
F-75822 Paris Cedex 17  
FRANCE



PCT

WRITTEN OPINION

(PCT Rule 66)



Applicant's or agent's file reference BIF022365/FL		Date of mailing (day/month/year) 03.09.2001
International application No. PCT/IB00/01902		REPLY DUE within 3 month(s) from the above date of mailing
International filing date (day/month/year) 18/12/2000	Priority date (day/month/year) 24/12/1999	
International Patent Classification (IPC) or both national classification and IPC C12M1/12		
Applicant MILLIPORE S.A. et al.		

1. This written opinion is the first drawn up by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain document cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

3. The applicant is hereby invited to reply to this opinion.


**When?** See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

**How?** By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

**Also:** For an additional opportunity to submit amendments, see Rule 66.4.  
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.  
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 24/04/2002.

Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer / Examiner Georgopoulos, N
	Formalities officer (incl. extension of time limits) Longo, E Telephone No. +49 89 2399 8141



## WRITTEN OPINION

International application No. PCT/IB00/01902

### I. Basis of the opinion

1. With regard to the **elements** of the international application (Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed"):

#### Description, pages:

1-14 as originally filed

#### Claims, No.:

1-35 as originally filed

#### Drawings, sheets:

1/7-7/7 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

## WRITTEN OPINION

International application No. PCT/IB00/01902

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

### V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

#### 1. Statement

Novelty (N)	Claims	1-6, 24, 26, 35
Inventive step (IS)	Claims	1-35
Industrial applicability (IA)	Claims	

2. Citations and explanations  
see separate sheet

### VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:  
see separate sheet

### VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:  
see separate sheet

Item V

- 1 Reference is made to the following documents:

D1: EP-A-0 059 809

D2: US-A-4 678 576

D3: EP-A-0 319 701

D4: US-A-4 319 996

D5: US-A-5 688 460

- 2 The subject-matter of present independent claims 1 and 35 as well as that of present dependent claims 2-6, 24 and 26, is not new (Art.33 (2) PCT).

- 2.1 D1 discloses a disposable filtration unit having a recoverable filter membrane comprising:

a/ a receptacle for receiving filtrate and an upstanding rim on said receptacle;  
b/ a support plate fixed to said receptacle and having at least one opening therethrough;  
c/ a filter membrane on said support plate;  
d/ an open ended shell for receiving a liquid to be filtered;  
e/ seal means between shell and support plate; and  
f/ breakaway means connecting said shell to said receptacle at spaced intervals about the periphery thereof, and providing weakened rupture points which permit separation of said shell and receptacle for recovery of said filter membrane. In the aforementioned filtration unit, said shell has a bifurcate lower end defining an inner foot, an outer foot and an intermediate groove. Said inner foot is adapted to press said filter membrane against said support plate and said outer foot is adapted to press said seal means against said support plate (see claims 1, 3 and 5 of D1). Furthermore, D1 discloses a filtration process using the above-mentioned filtration unit, wherein the latter is attached to a vacuum line (see page 5, lines 19 to 34 of D1).

- 2.2 Thus, the subject-matter of present independent claims 1 and 35 is anticipated by D1.

- 3 The subject-matter of present claim 1 is also anticipated by D2 (see claims 1, 2, 5 and 7 of D2). Moreover, said document anticipates the subject-matter of present dependent claims 2 to 6, 24 and 26 (see column 3, lines 15 to 36 and column 4, line 64 to column 5, line 4 of D2).
- 4 In contrast thereto, none of documents D3 to D5 anticipates the subject-matter of present independent claim 1, as none of said documents discloses locking means as in said claim (see claims 1 to 4 and figures 1 and 2 of D3; claims 1 to 3 of D4 and claims 1, 4, 5, 10 and 11 of D5). Furthermore, none of documents D2 to D5 discloses a method as claimed in present independent claim 35 (see column 3, line 37 to column 4, line 14 of D2; column 2, lines 12 to 39 of D3; column 3, line 53 to column 4, line 3 of D4 and column 3, lines 13 to 27 and column 4, lines 23 to 31 of D5).
- 5 Even if the applicant establishes novelty for the subject-matter of present independent claims 1 and 35, it appears that an inventive step (Art.33 (3) PCT) cannot be acknowledged, as present invention's problem of providing a device which exhibits the following technical advantages:
- i/ simpler and more convenient both in manufacture and in use; and
  - ii/ elimination of any risk of creasing the membrane (in wet state) when opening the device (see page 12, lines 1 to 2 and 21 to 23 of the present description), has already been solved in D1 (closest prior art document; see page 1, lines 5 to 9 of D1).
- 6 The subject-matter of present claims 1 to 35 is susceptible of industrial application in the field of industry of microbiological products (Art.33 (4) PCT).

**Item VII**

- 7 Contrary to the requirements of Rule 5.1 (a) (ii) PCT, the relevant background art disclosed in the documents D1-D5 is not mentioned in the description, nor are these documents identified therein.

**Item VIII**

- 8 The vague and imprecise statement in the description on page 14, lines 10 to 12, implies that the subject-matter for which protection is sought may be different to that

defined by the claims, thereby resulting in lack of clarity (Article 6 PCT) when used to interpret them (see also the PCT Guidelines, III - 4.3a).

- 9 In order to facilitate the examination of the conformity of the amended application with the requirements of Article 34 (2) (b) PCT, the applicant is requested to clearly identify the amendments carried out, no matter whether they concern amendments by addition, replacement or deletion, and to indicate the passages of the application as filed on which these amendments are based (see also Rule 66.8 (a) PCT). If the applicant regards it as appropriate these indications could be submitted in handwritten form on a copy of the relevant parts of the application as filed.



# RAPPORT DE RECHERCHE PRÉLIMINAIRE

établi sur la base des dernières revendications  
déposées avant le commencement de la recherche

N° d'enregistrement  
national

FA 584213  
FR 9916458

## DOCUMENTS CONSIDÉRÉS COMME PERTINENTS

DOCUMENTS CITÉS COMME PERTINENTS			
Catégorie	Citation du document avec indication, en cas de besoin, des parties pertinentes	Revendication(s) concernée(s)	Classement attribué à l'invention par l'INPI
X	EP 0 059 809 A (SYBRON CORP) 15 septembre 1982 (1982-09-15)	1-6, 23, 33	C12M1/12
Y	* page 5, ligne 19 - ligne 34; revendications; figures 1, 2 *	9, 10, 14, 20, 21, 23, 24, 27	C12M1/30 C12Q1/02
X	US 4 678 576 A (LEONCAVALLO RICHARD A) 7 juillet 1987 (1987-07-07)	1-4, 23	
Y	* figures 1, 2 *	9	
Y	EP 0 319 701 A (HEILMEIER & WEINLEIN) 14 juin 1989 (1989-06-14)	23, 24	
Y	* figures *		
Y	US 4 319 996 A (VINCENT MONTY E ET AL) 16 mars 1982 (1982-03-16)	23, 24, 27	
Y	* revendications; figures *		
Y	US 5 688 460 A (RUSCHKE RICK R) 18 novembre 1997 (1997-11-18)	9, 10, 14, 20, 21	
Y	* figures *		
A	US 5 308 483 A (SKLAR ERIC ET AL) 3 mai 1994 (1994-05-03)		DOMAINES TECHNIQUES RECHERCHÉS (Int.CL.7) C12M B01D B01L
Date d'achèvement de la recherche		Examineur	
27 octobre 2000		Coucke, A	
CATÉGORIE DES DOCUMENTS CITÉS			
X : particulièrement pertinent à lui seul Y : particulièrement pertinent en combinaison avec un autre document de la même catégorie A : arrière-plan technologique O : divulgation non-écrite P : document intercalaire T : théorie ou principe à la base de l'invention E : document de brevet bénéficiant d'une date antérieure à la date de dépôt et qui n'a été publié qu'à cette date de dépôt ou qu'à une date postérieure. D : cité dans la demande L : cité pour d'autres raisons & : membre de la même famille, document correspondant			

**ANNEXE AU RAPPORT DE RECHERCHE PRÉLIMINAIRE  
RELATIF A LA DEMANDE DE BREVET FRANÇAIS NO. FR 9916458 FA 584213**

La présente annexe indique les membres de la famille de brevets relatifs aux documents brevets cités dans le rapport de recherche préliminaire visé ci-dessus.  
Les dits membres sont contenus au fichier informatique de l'Office européen des brevets à la date du 27-10-2000  
Les renseignements fournis sont donnés à titre indicatif et n'engagent pas la responsabilité de l'Office européen des brevets, ni de l'Administration française

Document brevet cité au rapport de recherche	Date de publication	Membre(s) de la famille de brevet(s)	Date de publication
EP 0059809 A	15-09-1982	AU 541787 B	17-01-1985
		AU 7613881 A	09-09-1982
		CA 1176575 A	23-10-1984
		DE 3169275 D	18-04-1985
		JP 1326266 C	16-07-1986
		JP 57144013 A	06-09-1982
		JP 60049005 B	30-10-1985
		US 4614585 A	30-09-1986
US 4678576 A	07-07-1987	AU 553526 B	17-07-1986
		AU 8794682 A	24-03-1983
		CA 1198063 A	17-12-1985
		DE 3268134 D	06-02-1986
		EP 0075405 A	30-03-1983
		JP 1008295 B	13-02-1989
		JP 1526071 C	30-10-1989
		JP 58061439 A	12-04-1983
EP 0319701 A	14-06-1989	DE 3741388 C	30-03-1989
		JP 2002809 A	08-01-1990
US 4319996 A	16-03-1982	CA 1171365 A	24-07-1984
		FR 2493720 A	14-05-1982
		GB 2086752 A,B	19-05-1982
		JP 1256843 C	29-03-1985
		JP 57091711 A	08-06-1982
		JP 59033403 B	15-08-1984
US 5688460 A	18-11-1997	US 5556541 A	17-09-1996
		CA 2131359 A	27-10-1995
		EP 1016443 A	05-07-2000
		EP 0679490 A	02-11-1995
		JP 7289858 A	07-11-1995
US 5308483 A	03-05-1994	CA 2143421 A	17-03-1994
		EP 0656803 A	14-06-1995
		JP 8500527 T	23-01-1996
		WO 9405395 A	17-03-1994

EPO FORM P0485



# PATENT COOPERATION TREATY

F-2

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

RINUY, SANTARELLI  
14, avenue de la Grande Armée  
B.P. 237  
F-75822 Paris Cedex 17  
FRANCE

Arrivé le  
21. NOV. 2001  
RINUY SANTARELLI

SAISIE  
21 NOV. 2001  
PCT

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT  
(PCT Rule 71.1)

Date of mailing  
(day/month/year) 19.11.2001

Applicant's or agent's file reference  
BIF022365/FL

## IMPORTANT NOTIFICATION

International application No.  
PCT/IB00/01902

International filing date (day/month/year)  
18/12/2000

Priority date (day/month/year)  
24/12/1999

Applicant  
MILLIPORE S.A. et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

### 4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/

 European Patent Office  
D-80298 Munich  
Tel. +49 89 2399 - 0 Tx: 523656 epmu d  
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Authorized officer

Longo, E

Tel. +49 89 2399-8141



# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>BIF022365/FL</b>	<div style="display: flex; justify-content: space-between;"> <div> <b>FOR FURTHER ACTION</b> </div> <div>           See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)         </div> </div>	
International application No. <b>PCT/IB00/01902</b>	International filing date (day/month/year) <b>18/12/2000</b>	Priority date (day/month/year) <b>24/12/1999</b>
International Patent Classification (IPC) or national classification and IPC <b>C12M1/12</b>		
Applicant <b>MILLIPORE S.A. et al.</b>		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 8 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 10 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand  <b>12/05/2001</b>	Date of completion of this report  <b>19.11.2001</b>
Name and mailing address of the international preliminary examining authority:  <div style="display: flex; align-items: center;"> <div>             European Patent Office              D-80298 Munich              Tel. +49 89 2399 - 0 Tx: 523656 epmu d              Fax: +49 89 2399 - 4465           </div> </div>	Authorized officer  <b>Georgopoulos, N</b>  Telephone No. +49 89 2399 2634



# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IB00/01902

## I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

### Description, pages:

1,4-13	as originally filed			
2,3,3a-3b,14	as received on	02/11/2001	with letter of	30/10/2001

### Claims, No.:

1-33	as received on	02/11/2001	with letter of	30/10/2001
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### Drawings, sheets:

1/7-7/7	as originally filed
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/IB00/01902

- ☐ the description,      pages:  
☐ the claims,      Nos.:  
☐ the drawings,      sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).  
*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application.  
☒ claims Nos. 1-33.

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
- ☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 1-33 are so unclear that no meaningful opinion could be formed (*specify*):  
**see separate sheet**
- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
- ☐ no international search report has been established for the said claims Nos. .

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

- ☐ the written form has not been furnished or does not comply with the standard.  
☐ the computer readable form has not been furnished or does not comply with the standard.

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IB00/01902

## 1. Statement

Novelty (N)	Yes:	Claims	7-23, 25, 27-34, 35
	No:	Claims	1-6, 24, 26
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-35
Industrial applicability (IA)	Yes:	Claims	1-35
	No:	Claims	

## 2. Citations and explanations see separate sheet

## VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:  
see separate sheet

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/IB00/01902

**Item III**

- 1 Present claims 1-33 are so unclear (Art.6 PCT) that no meaningful examination with respect to novelty, inventive step and industrial applicability can be carried out for their subject-matter. The reasons for this lack of clarity are as follows:
  - 1.1 It is not clear to which technical feature(s) of present independent claim 1:
    - i/ the expression "one out of the latter" (see 16<sup>th</sup> line of said claim); and
    - ii/ the word "which" (see 18<sup>th</sup> line of said claim), refer back.
  - 1.2 The aforementioned objection under Art.6 PCT, applies *mutatis mutandis* to present claims 2 to 33 (and to the respective parts of the present description).
- 2 Therefore, the examination with respect to novelty, inventive step and industrial applicability will be based on the originally filed application documents.

**Item V**

- 3 It should be noted that apart from the above-mentioned objection under Art.6 PCT, the replacement of the expression "said tab and said wall (42) having" (see originally filed claim 15) by the wording "being provided" in present claim 12, introduces subject-matter which goes beyond the content of the application as originally filed: in present claim 12 "means (23, 24, 25)" are, generally, "provided" (and not provided on the latching tab and the wall of the originally filed claim 15).  
Thus, said amendment leads to a broadening of the originally filed invention's scope, contrary to the requirements of Art.34 (2) (b) PCT.
- 4 Reference is made to the following documents:  
  
D1: EP-A-0 059 809  
D2: US-A-4 678 576  
D3: EP-A-0 319 701  
D4: US-A-4 319 996  
D5: US-A-5 688 460

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/IB00/01902

- 5 The subject-matter of present independent claim 1 as well as that of present dependent claims 2-6, 24 and 26, is not new (Art.33 (2) PCT).
- 5.1 D1 discloses a disposable filtration unit having a recoverable filter membrane comprising:
- a/ a receptacle for receiving filtrate and an upstanding rim on said receptacle;
  - b/ a support plate fixed to said receptacle and having at least one opening therethrough;
  - c/ a filter membrane on said support plate;
  - d/ an open ended shell for receiving a liquid to be filtered;
  - e/ seal means between shell and support plate; and
  - f/ breakaway means connecting said shell to said receptacle at spaced intervals about the periphery thereof, and providing weakened rupture points which permit separation of said shell and receptacle for recovery of said filter membrane. In the aforementioned filtration unit, said shell has a bifurcate lower end defining an inner foot, an outer foot and an intermediate groove. Said inner foot is adapted to press said filter membrane against said support plate and said outer foot is adapted to press said seal means against said support plate (see claims 1, 3 and 5 of D1).
- 5.2 Thus, the subject-matter of present independent claim 1 is anticipated by D1.
- 5.3 The subject-matter of present claim 1 is also anticipated by D2 (see claims 1, 2, 5 and 7 of D2). Moreover, said document anticipates the subject-matter of present dependent claims 2 to 6, 24 and 26 (see column 3, lines 15 to 36 and column 4, line 64 to column 5, line 4 of D2).
- 6 In contrast thereto, none of documents D3 to D5 anticipates the subject-matter of present independent claim 1, as none of said documents discloses locking means as in said claim (see claims 1 to 4 and figures 1 and 2 of D3; claims 1 to 3 of D4 and claims 1, 4, 5, 10 and 11 of D5).
- 7 The subject-matter of present independent claim 35 is new (Art.33 (2) PCT), for the following reasons:
- 7.1 D1 discloses a filtration process using the aforementioned filtration unit, wherein said

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EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/IB00/01902

unit is attached to a vacuum line (see page 5, lines 19 to 34 of D1). However, there is no disclosure in said document of placing said filtration unit on a vacuum flask as in present claim 35: the spout (20) serves as a connector for attachment to a vacuum line and as an air vent (see also figure 1 of D1).

- 7.2 Furthermore, none of documents D2 to D5 discloses a method as claimed in present independent claim 35 (see column 3, line 37 to column 4, line 14 of D2; column 2, lines 12 to 39 of D3; column 3, line 53 to column 4, line 3 of D4 and column 3, lines 13 to 27 and column 4, lines 23 to 31 of D5).
- 8 The subject-matter of present independent claim 35 does not involve an inventive step (Art.33 (3) PCT), for the following reasons:
- 8.1 D1 is considered to represent the closest prior art document. The technical problem to be solved by the present invention may therefore be seen in as how to provide an alternative to the method of D1 (see page 12, lines 1 to 2 and 21 to 23 of the present description and page 1, lines 5 to 9 of D1).
- The difference between present invention's method and that of D1 resides in the fact that the former comprises the step of placing the device on a vacuum flask, whereas the latter comprises the step of attaching said device to a vacuum line (see also point 7.1 above).
- Said difference seems to be an obvious selection over a number of known technical equivalents and therefore does not bring about any unexpected technical effect or advantage. Thus, the subject-matter of present independent claim 35 would be obvious to the person skilled in the art in regard of D1.
- 9 Even if the applicant establishes novelty for the subject-matter of present independent claim 1, it appears that an inventive step (Art.33 (3) PCT) cannot be acknowledged, as present invention's problem of providing a device which exhibits the following technical advantages:
- i/ simpler and more convenient both in manufacture and in use; and
  - ii/ elimination of any risk of creasing the membrane (in wet state) when opening the device (see page 12, lines 1 to 2 and 21 to 23 of the present description), has already been solved in D1 (closest prior art document; see page 1, lines 5 to 9 of D1).



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- 10 The subject-matter of present claims 1 to 35 is susceptible of industrial application in the field of the industry of devices designed for the microbiological examination of liquid products (Art.33 (4) PCT).

**Item VII**

- 11 Contrary to the requirements of Rule 5.1 (a) (ii) PCT, the relevant background art disclosed in the documents D3-D5 is not mentioned in the description, nor are these documents identified therein. It should be noted that D3-D5 can, according to the requirements of Rule 5.1 (a) (ii), be regarded as "useful for the understanding and examination of the invention".

EP. 059 809 A discloses a disposable filtration unit for similar purposes but where the sample of liquid is not under pressure. This device comprises as intake body an open ended shell, and, as drainage body, a cup-shaped receptacle, a funnel-shaped support plate for the filtering membrane and a support pad laid on the support plate which is carried by an internal shoulder of the receptacle to which it can be permanently attached by a suitable cement or by ultrasonic welding. The lower end of the shell has a necked portion so that it can be received into a rim of the receptacle, the axial length of the necked portion and its position within the rim being such that there is some axial distance between the top of the receptacle rim and an edge of the necked portion. A plurality of vertical ribs are formed integral with the shell. These ribs have sufficient length to bridge this axial distance and can be attached to the upper end of the receptacle rim by ultrasonic welding so as to fix the shell to the receptacle. Because the attachment of the ribs to the receptacle occurs only at spaced intervals about the periphery of the receptacle, the ribs provides weak "breakaway" points so as to facilitate removal of the shell from the receptacle. In one embodiment, a flat, annular gasket is disposed between the lower end face of the shell and the support plate, the inner periphery of this gasket being squeezed between an inner foot of the shell and the filtering membrane whereas the outer periphery of the gasket is squeezed by an outer foot of the shell and rests on the rim of the support plate, this gasket thus providing, on the one hand, a liquid-tight seal between the shell and the filtering membrane and, on the other hand, an air-tight seal between the shell and the support plate. In other embodiments, the support plate comprises an upstanding tongue which is received between the inner foot and the outer foot of the shell whereas the flat, annular gasket is replaced by a gasket which has been put in a space between the rim and the tongue of the receptacle.

US 4 678 576 A discloses a device for similar purposes, but not for a liquid under pressure. The disclosed device comprises, as intake body, an open ended upper body, and, as a drainage body, a cup-shaped receptacle and a support plate, a locking rim being further provided to lock the intake body and the drainage body. The support plate is sandwiched between an upper collar

portion of a collar included in the receptacle and an internal shoulder of a necked portion including the upper body, the ring being engaged respectively, by its internal thread, with the external thread of the lower portion of the collar of the receptacle and, by an upper rim, with the lower external shoulder of a split  
5 flange included in the upper body. In one embodiment, two O-rings are provided respectively on one side and on the other of the support plate whereas in another embodiment, a single H-shaped gasket is provided.

The invention relates to a device of the same kind as known through French patent 2 677 664, but simpler, more convenient and more economical,  
10 both in manufacture and in use.

To that end it proposes a device for microbiological examination of a sample of liquid under pressure, having an intake body, a filtering membrane and a drainage body, said intake body having a reservoir, in one wall of which a liquid input aperture is made, said membrane closing said reservoir, said  
15 drainage body having means of supporting said membrane on the opposite side from said reservoir and a liquid output aperture, said intake body and said drainage body having integrally moulded mutual locking means; characterised in that said membrane is gripped annularly at the periphery between a first member forming part of said intake body and a second member forming part of  
20 said drainage body with one out of said first member and said second member having an elastomer seal by means of which it comes into contact with said membrane, and in that said locking means are adapted to allow the opening of said device by requiring only a separation movement between said first member and said second member, said locking means having means of axial latching  
25 between the intake body and the drainage body, one out of the latter having at least one axially oriented latching tab while the other has means of receiving said latching tab, which extends projecting from the edge of a skirt forming part of that one out of said intake body and said drainage body which includes it.

Thus, unlike the aforementioned earlier device known through French patent 2 677 664, where the locking means are constituted by thread  
30 elements, the opening of the device according to the invention is performed with no rotational movement between the intake body and the drainage body.

The device according to the invention therefore makes it possible to eliminate any risk of creasing the membrane at the time of opening the device where it is then in the wet state.

Furthermore, the elastomer seal, although it is present only on one of the faces of the membrane, makes it possible to obtain sealing on both faces of the membrane, that is to say both with the first member and with the second member, from the simple fact that said members grip the membrane, that is to say they are held close to one another, so that it is not necessary, in order to close the device according to the invention, to perform a rotational movement, unlike the above-mentioned earlier device known through French patent 2 677 664 which requires, so that the sealing lip on the intake body is applied with the required intensity on the drainage body, that assembly is carried out by screwing with a considerable torque.

The device according to the invention is therefore much simpler and more convenient to use than the above-mentioned earlier device known through French patent 2 677 664, and is furthermore simpler to manufacture, since there is no need, on the one hand, to make provision for achieving sealing between the membrane and the intake body by welding, and, on the other hand, sealing around the membrane between the intake body and the drainage body, given that, in the device according to the invention, the gripping of the membrane between the first member and the second member makes it possible to obtain these two instances of sealing directly.

Thanks to the fact that the locking means have means of axial latching between the intake body and the drainage body, the assembly of the device according to the invention is particularly simple, since it is sufficient to bring the intake body and the drainage body together in order to lock them by latching.

It should be noted that the elastomer seal, on account of its elasticity, takes up the play necessary for enabling latching, so that, once assembled, the intake body and the drainage body are held with no axial play with respect to one another.

3b

The fact that one out of the intake body and the drainage body has at least one axially oriented latching tab while the other has means of receiving said latching tab, is preferred for reasons of simplicity and convenience, both in manufacture and in use.

- 5            Preferably, the membrane is held exclusively on account of it being gripped annularly at the periphery between said first member and said second member.

- 10           The manufacture and use of the device according to the invention are thus particularly simple, since no operation such as the sealing of the membrane existing in the earlier device has to be implemented, while, after opening of the device according to the invention, the membrane, which is fixed neither to the first member nor to the second member, can be recovered directly, for example with sterile tweezers in order to be put into culture in a conventional Petri dish.

there always remains, notably in the pad 48, a certain amount of the sampled liquid which mixes with the injected culture medium which is therefore diluted.

In variants, not depicted, it is the drainage body 3, and not the intake body 2, which has the elastomer seal such as the seal 13 described above; the  
5 male and female latching elements between the bodies 2 and 3 are provided respectively on the drainage body 3 and the intake body 2, rather than the reverse; and/or use is made of latching means of different type, locking means having hinge means between the bodies 2 and 3 and latching means opposite  
10 the hinge means, or means of locking other than by latching.

CLAIMS

1. Device for microbiological examination of a sample of liquid under pressure, having an intake body, a filtering membrane and a drainage body, said intake body having a reservoir, in one wall of which a liquid input aperture is made, said membrane closing said reservoir, said drainage body having means of supporting said membrane on the opposite side from said reservoir and a liquid output aperture, said intake body and said drainage body having integrally moulded mutual locking means; characterised in that said membrane (4) is gripped annularly at the periphery between a first member (9) forming part of said intake body (2) and a second member (32) forming part of said drainage body (3) with one out of said first member and said second member having an elastomer seal (13) by means of which it comes into contact with said membrane (4), and in that said locking means (7, 31) are adapted to allow the opening of said device by requiring only a separation movement between said first member (9) and said second member (32), said locking means having means of axial latching (7, 31) between the intake body (2) and the drainage body (3), one out of the latter having at least one axially oriented latching tab (7) while the other has means of receiving (42, 44, 45) said latching tab, which extends projecting from the edge of a skirt (6) forming part of that one out of said intake body (2) and said drainage body (3) which includes it.

2. Device according to Claim 1, characterised in that the membrane (4) is held exclusively on account of it being gripped annularly at the periphery between said first member (9) and said second member (32).

3. Device according to either one of Claims 1 or 2, characterised in that said seal (13) is moulded on to that one out of said first member (9) and said second member (32) which includes it.

4. Device according to any one of Claims 1 to 3, characterised in that it is the first member (9) which has said elastomer seal (13).

5. Device according to Claim 4, characterised in that said first member (9) forms a lateral wall of said reservoir (5) of the intake body (2), said wall (9) finishing at one end in an edge forming part of said seal (13).

6. Device according to Claim 5, characterised in that a groove (14) is made at the end of a rigid part of said lateral wall (9) while said seal (13) has a T-shaped profile whose longitudinal branch forms a rib (50) inserted into said groove (14) and whose transverse branch forms a cushion (51) which is in  
5 contact with the membrane (4).

7. Device according to Claim 6, characterised in that there is a bevel (54) between the rib (50) and the cushion (51) on the external side, while, on the internal side, the rib (50) and the cushion (51) are connected by a straight surface.

10 8. Device according to either one of Claims 6 or 7, characterised in that said cushion (51) has two annular lips (53).

9. Device according to any one of Claims 1 to 8, characterised in that said latching tab is connected to the remainder of that one out of said intake body (2) and said drainage body (3) which includes it, by a breakable  
15 zone.

10. Device according to Claim 9, characterised in that said breakable zone is situated in the region of a dihedral (20) in one of the surfaces (19) of said latching tab (7).

11. Device according to Claim 10, characterised in that said surface  
20 (19) having a dihedral (20) is situated on the internal side of the latching tab (7).

12. Device according to any one of Claims 1 to 11, characterised in that that one out of said intake body (2) and said drainage body (3) which has means of receiving said latching tab (7) has a wall (42) oriented transversely and provided with an opening (44) through which the latching tab (7) can pass,  
25 means (23, 24, 45) being provided for preventing the withdrawal of the tab (7) once it has been pushed right into the opening (44).

13. Device according to Claim 12, characterised in that said means (23, 24, 25) for preventing the withdrawal of the latching tab (7) are provided on the latter and on said wall (42).

30 14. Device according to Claim 13, characterised in that said means for preventing the withdrawal of the latching tab (7) have, on said wall (42), a



tooth (45) oriented axially and bordering said opening and having, on said latching tab, a groove (23) adapted to accommodate said tooth (45).

15. Device according to any one of Claims 12 to 14, characterised in that said transversely oriented wall (42) is connected to a lateral wall (43) extending on the opposite side from that one out of said intake body (2) and said drainage body (3) which has the latching tab (7), with the dimension in the axial direction of said lateral wall (43) being greater than the dimension in the axial direction of the latching tab (7).

16. Device according to Claim 15, characterised in that a notch (46) is made in said lateral wall (46) at the level of said opening (44), to make it possible to press on said latching tab (7).

17. Device according to any one of Claims 1 to 16, characterised in that it is the intake body (2) which has the latching tab (7), and in that it is the drainage body (3) which has the means of receiving (42, 44, 45) said latching tab (7).

18. Device according to any one of Claims 1 to 17, characterised in that one out of said intake body (2) and said drainage body (3) has a number of said latching tabs (7).

19. Device according to Claim 18, characterised in that it has four latching tabs (7).

20. Device according to any one of Claims 1 to 19, characterised in that said locking means comprise exclusively said axial latching means (7, 31).

21. Device according to any one of Claims 1 to 20, characterised in that said drainage body (3) has a circular table (30) provided at its centre with means of supporting (48) said membrane (4) and having, around said support means (48), a wall (32) having a surface (33) situated facing said elastomer seal (13), which forms part of said intake body (2), said membrane (4) being squeezed between said surface (33) and said seal (13).

22. Device according to Claim 21, characterised in that said support means (48) have a concave surface facing said membrane (4).

23. Device according to Claim 22, characterised in that the ratio of the difference between the length of the arc corresponding to the profile, in a

diametral plane, of said surface of said support means (48) and between the length of the chord of this arc, over the latter length, corresponds to the coefficient of expansion of said membrane (4) between the dry state and the wet state.

5           24. Device according to any one of Claims 21 to 23, characterised in that said support means are formed by a porous pad (48).

          25. Device according to Claim 24, characterised in that said drainage body (3) has drainage channels (39) under said porous pad (48), said drainage channels opening into said output aperture (38).

10           26. Device according to any one of Claims 21 to 25, characterised in that the external diameter of said circular table (30) corresponds substantially to the internal diameter of a skirt (6) included in said intake body (2), said skirt (6) encircling said circular table (30).

          27. Device according to Claim 26, characterised in that areas of  
15 extra thickness for wedging (27) are provided between said circular table (30) and said skirt (6).

          28. Device according to any one of Claims 21 to 27, characterised in that said drainage body has a skirt (31) disposed in a step with respect to said circular table (30).

20           29. Device according to Claim 28, characterised in that said skirt (31) has means of latching (42, 44, 45) with said intake body (2).

          30. Device according to either one of Claims 28 or 29, characterised in that said skirt (31) of the drainage body (3) has at least one notch (47) adapted to allow the placing of a drainage syringe (64).

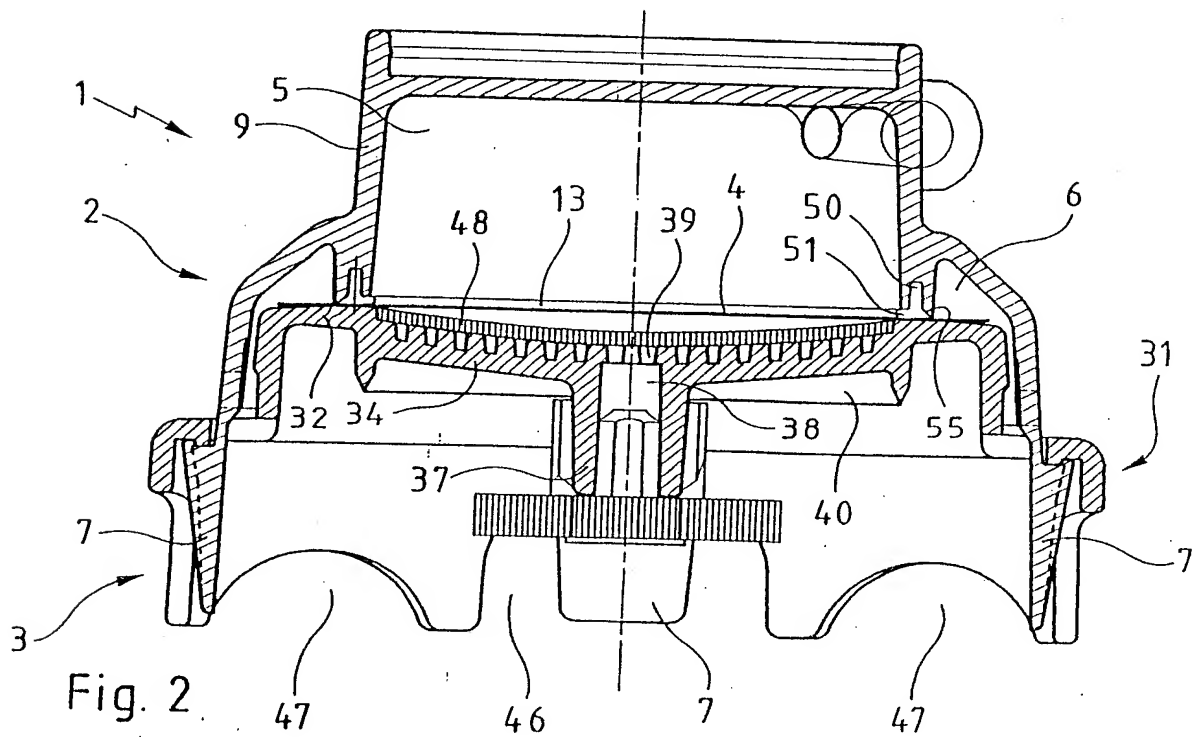
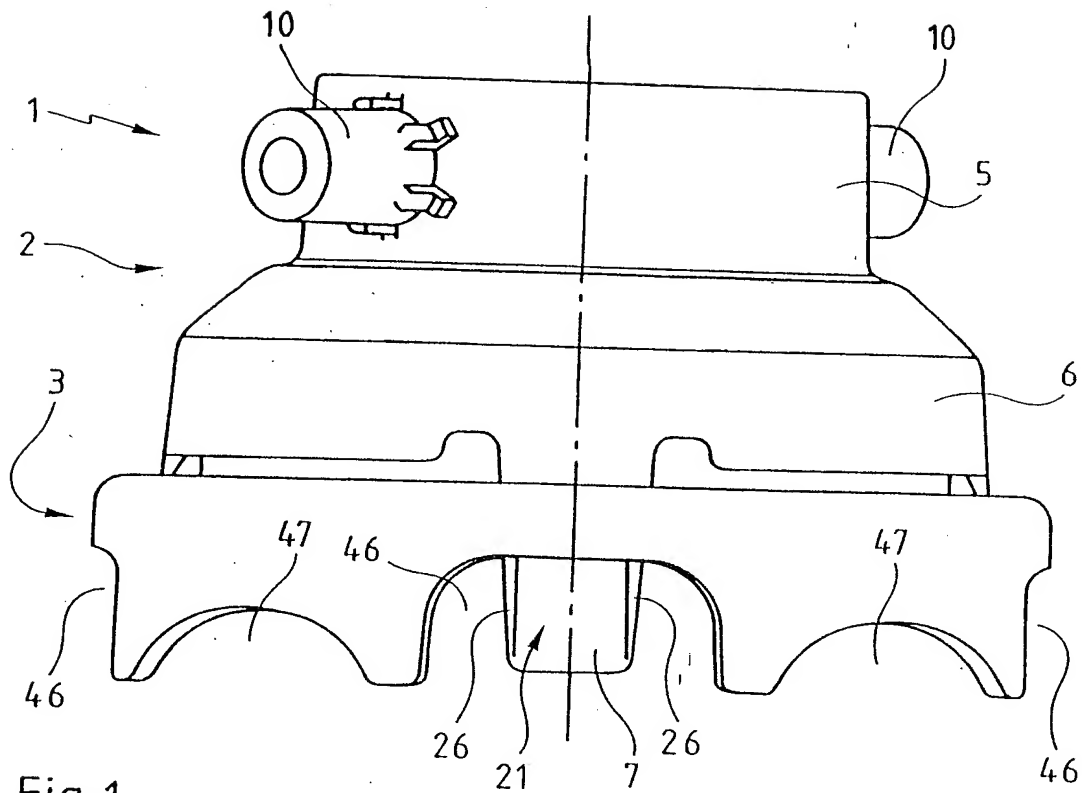
25           31. Device according to any one of Claims 1 to 30, characterised in that said output aperture (38) of the drainage body (3) is in the continuation of the internal passage of a coaxially disposed output pipe (37).

          32. Device according to Claim 31, characterised in that said drainage  
30 body (3) has, around said output pipe (37), an annular rib (40) tapering towards its end.

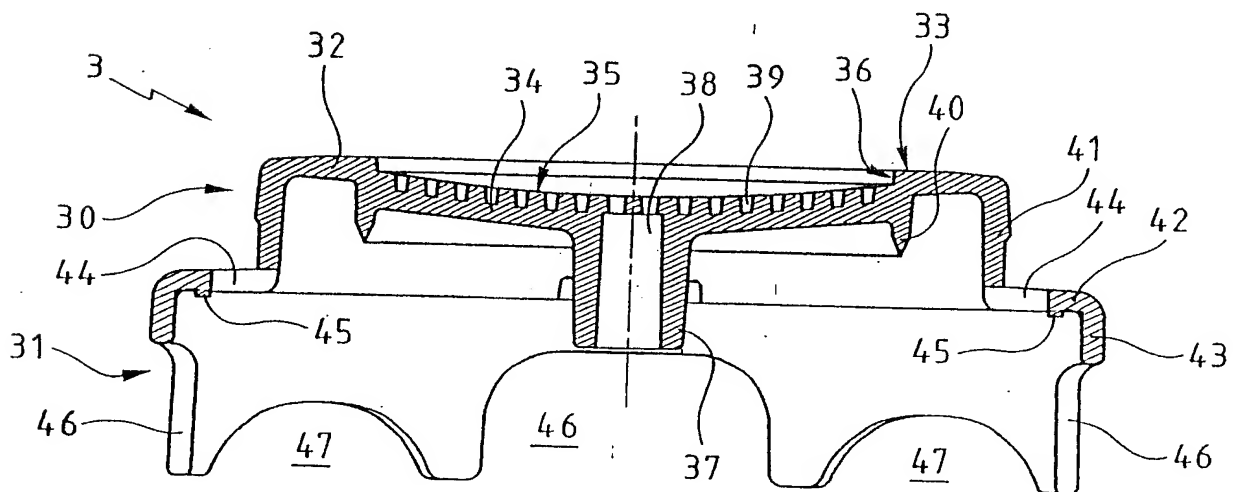
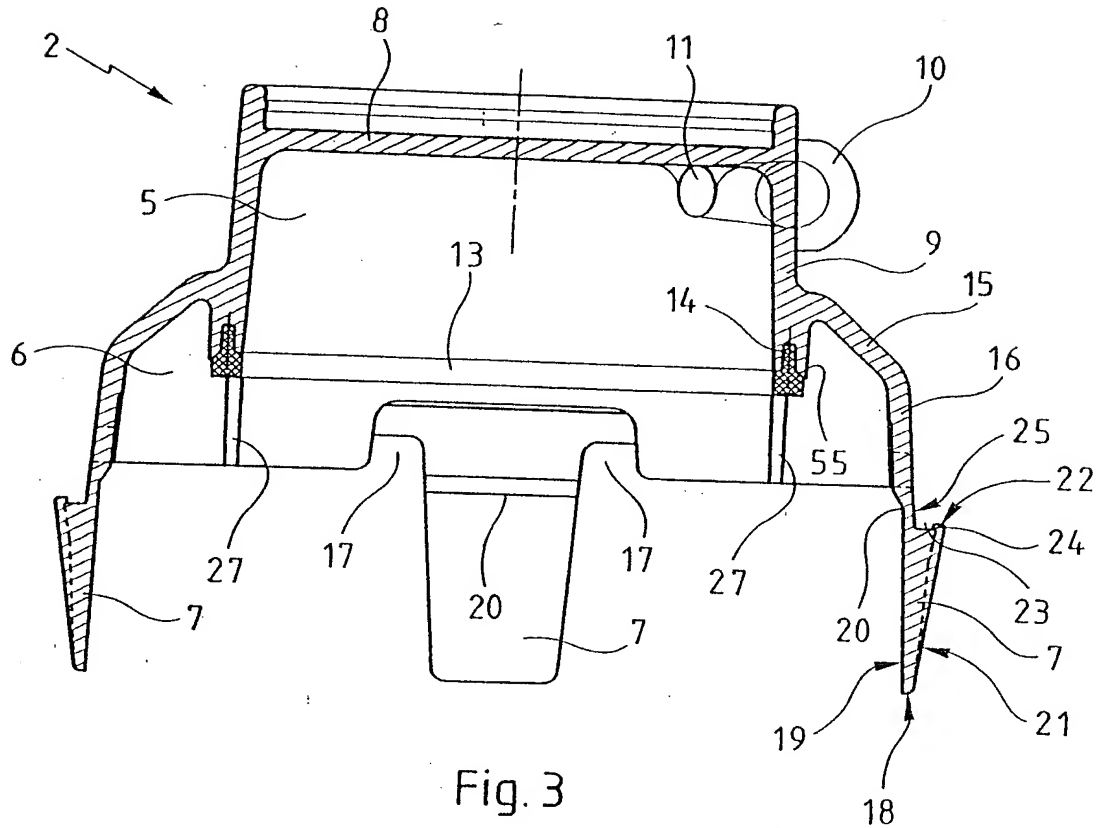
          33. Method for draining a device according to Claim 32, characterised in that it is placed on a vacuum flask (71) with said output pipe

(37) engaged in the central hole (75) of the stopper (74) of said flask and said annular rib (40) resting on this stopper.

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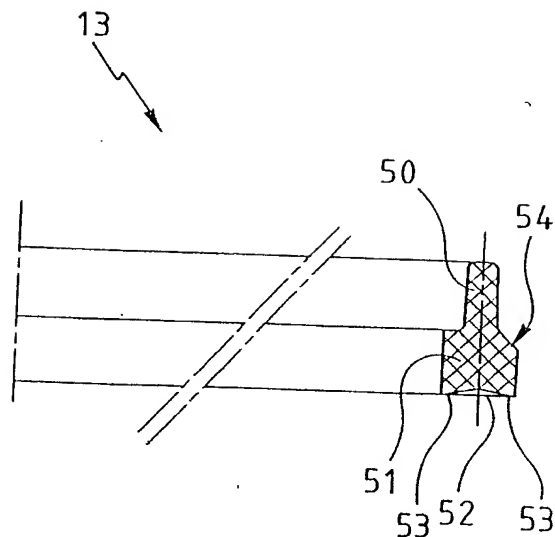


Fig. 6

Fig. 5

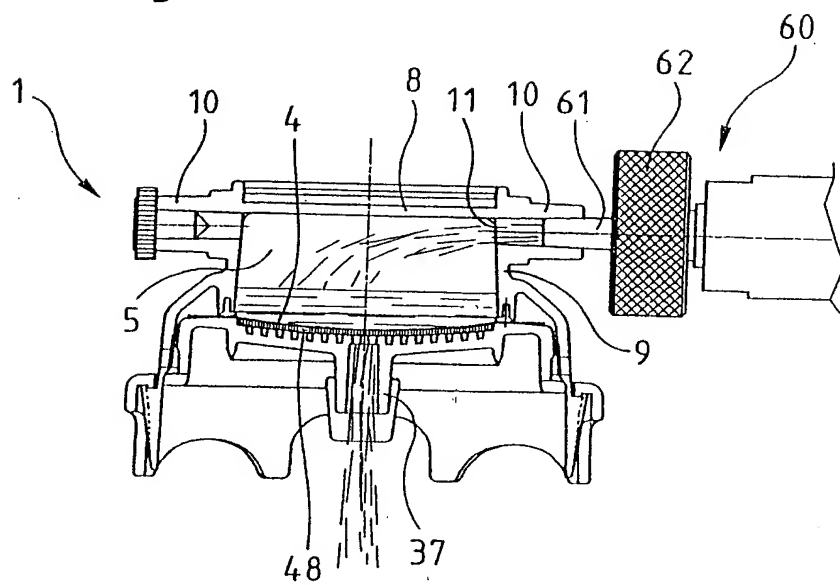


Fig. 7

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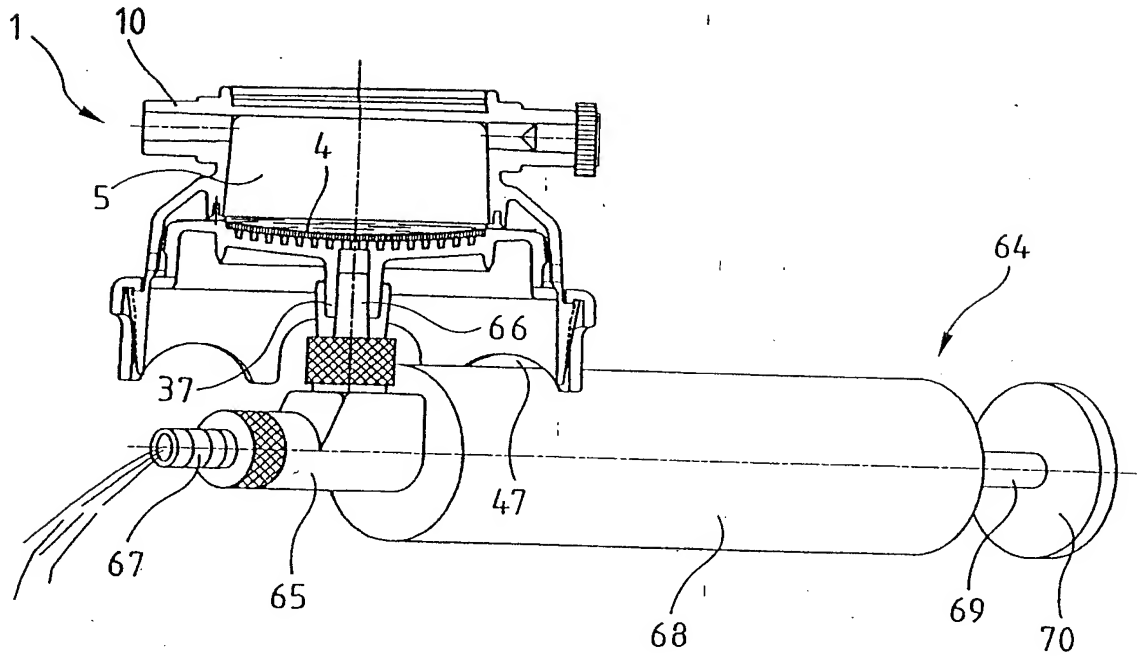


Fig. 8

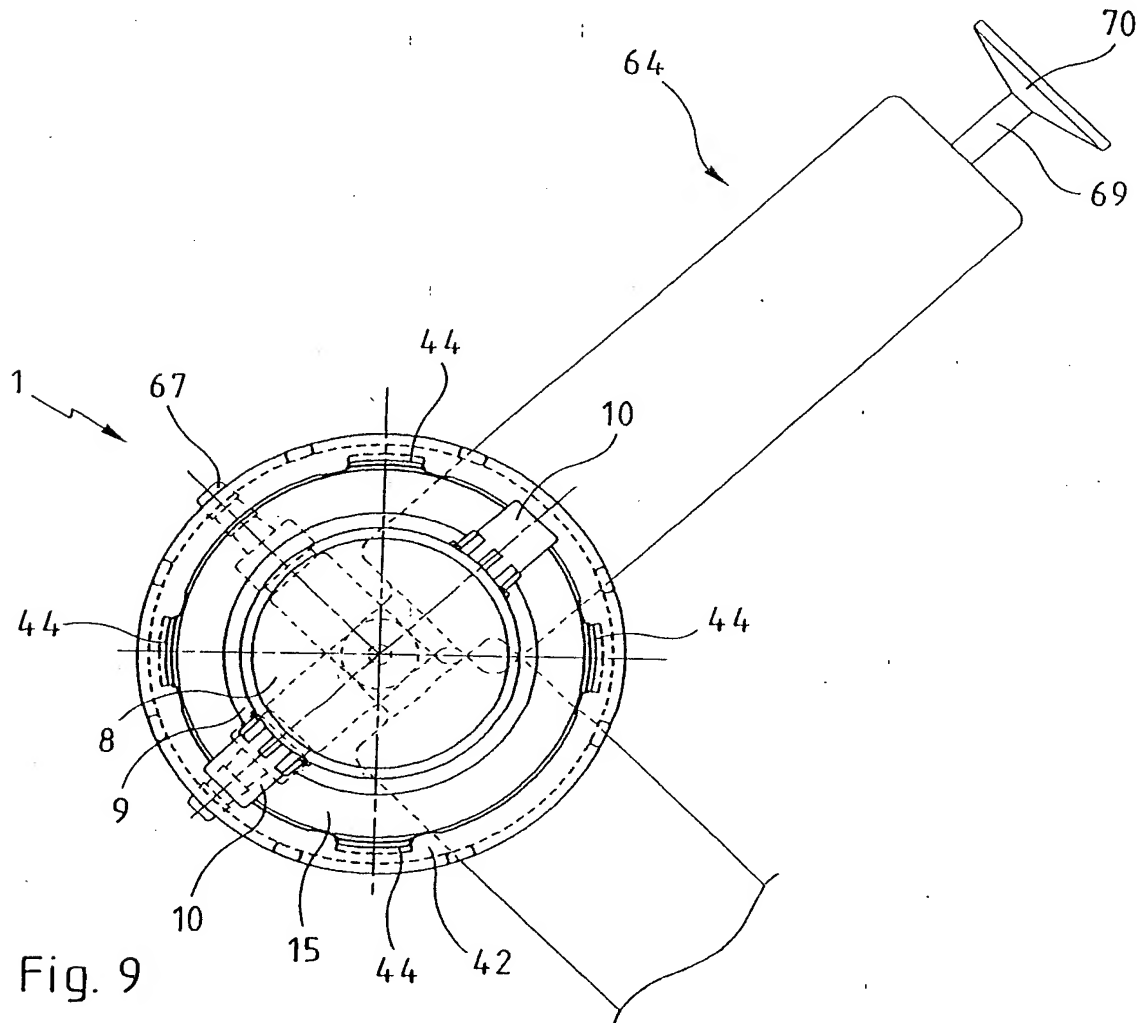


Fig. 9

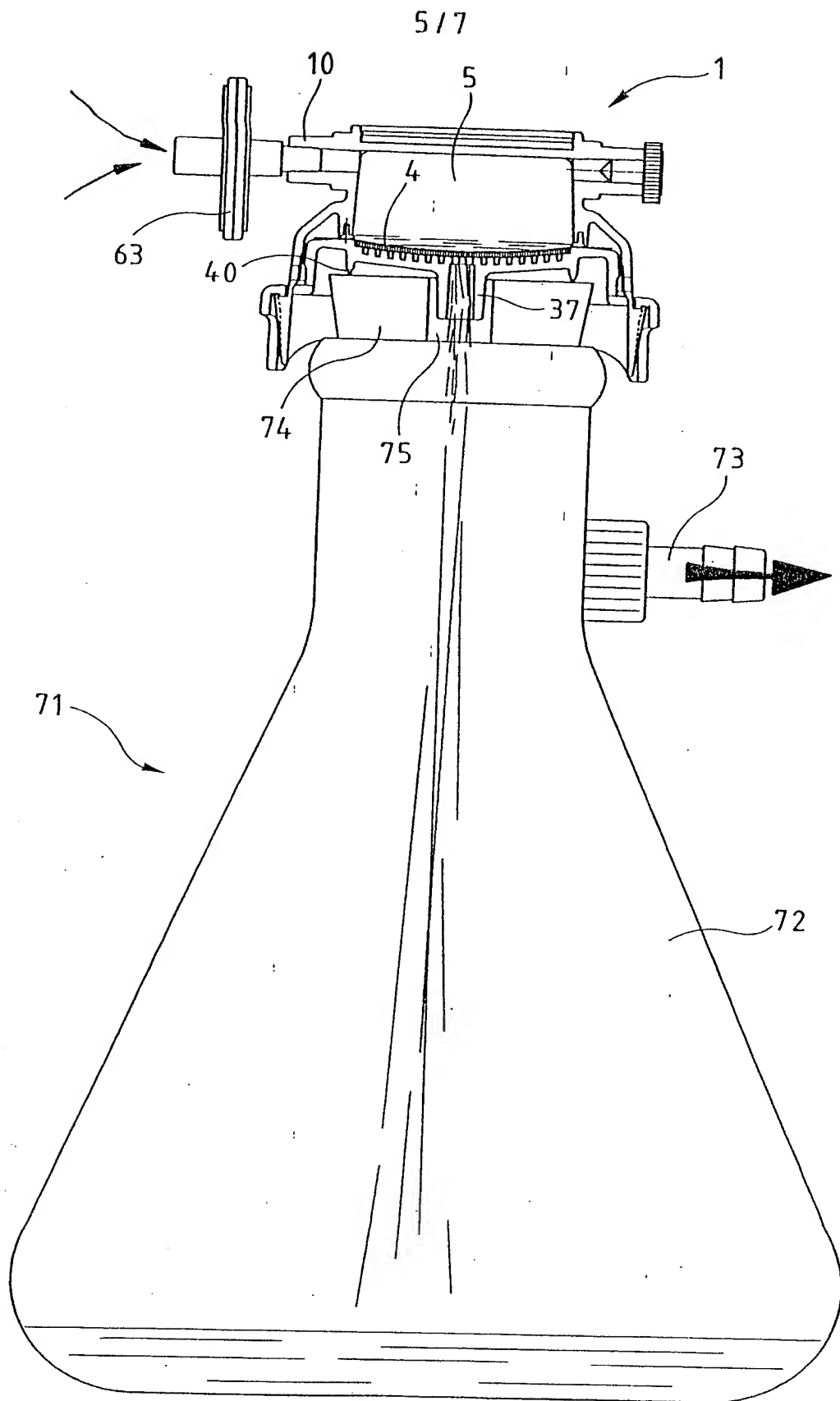


Fig.10



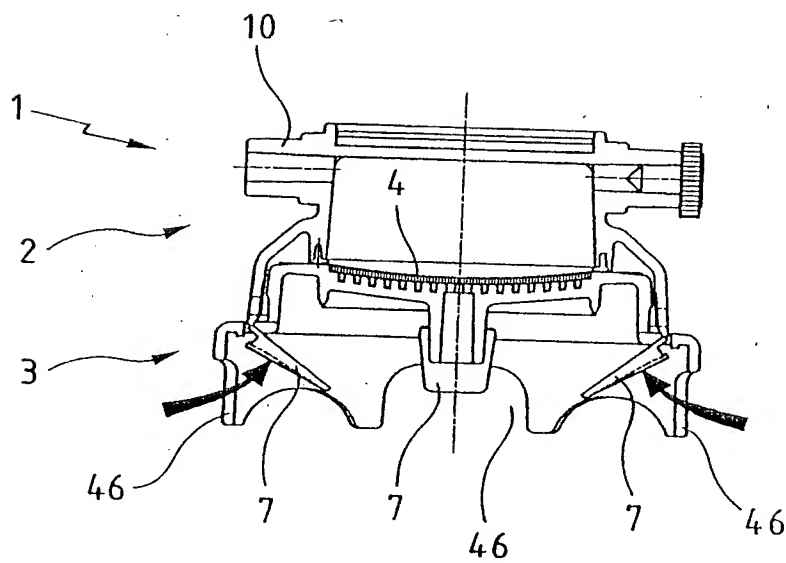


Fig. 11

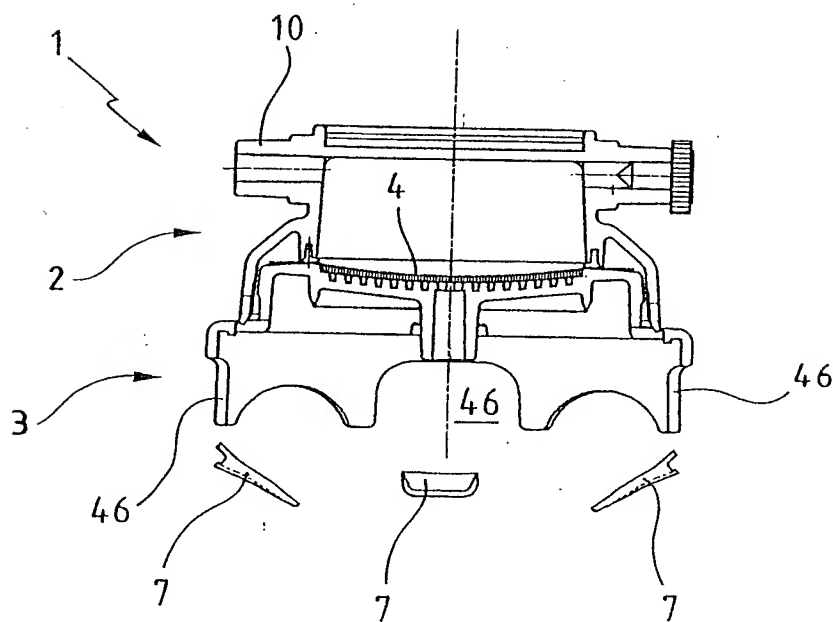
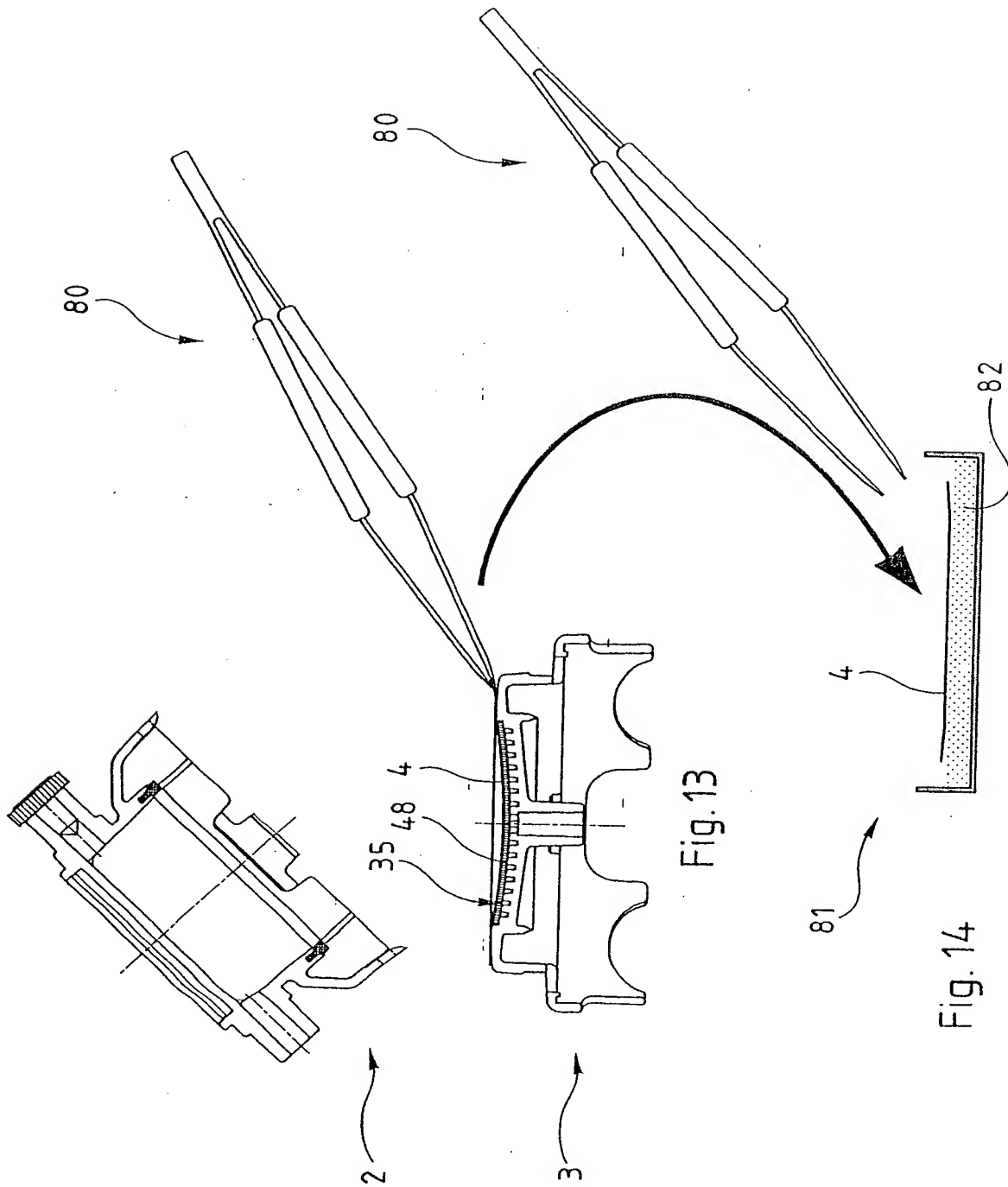


Fig. 12



7/pvld

MCA-514 PC/US

## DEVICE FOR MICROBIOLOGICAL EXAMINATION OF A SAMPLE OF LIQUID UNDER PRESSURE AND METHOD FOR DRAINING THIS DEVICE

The invention relates to the devices for microbiological examination of a sample of liquid under pressure.

Such a device is already known through French patent 2 677 664, having an intake body, a filtering membrane and a drainage body. The intake body has a reservoir, in one wall of which a liquid input aperture is made, the membrane closing this reservoir by being welded on to the edge of the lateral wall of this reservoir, the drainage body being designed to support the membrane on the opposite side from the reservoir and being provided with a liquid output aperture, the intake body and the drainage body locking with one another by screwing by virtue of integrally moulded thread elements.

The taking of a sample to be examined is performed by connecting the input aperture of the reservoir of the intake body to a source of liquid under pressure, so that the reservoir fills with this liquid, which can leave therefrom only through the filtering membrane, this liquid being recovered from the other side of the membrane by the drainage body and emptied therefrom through the output aperture.

In order to avoid the liquid which has passed through the membrane escaping from the drainage body somewhere other than through the output aperture, the intake body has, around the membrane, a flange provided with a lip coming to rest on the drainage body in order to obtain the required sealing.

This makes it possibly notably, for example by collecting the liquid emptied through the output aperture in a graduated container, to know accurately the volume of the sample of liquid which has passed through the membrane.

EP 059 809 A discloses a disposable filtration unit for similar purposes but where the sample of liquid is not under pressure. This device comprises as intake body an open ended shell, and, as drainage body, a cup-shaped receptacle, a funnel-shaped support plate for the filtering membrane and a support pad laid on the support plate which is carried by an internal shoulder of

the receptacle to which it can be permanently attached by a suitable cement or by ultrasonic welding. The lower end of the shell has a necked portion so that it can be received into a rim of the receptacle, the axial length of the necked portion and its position within the rim being such that there is some axial distance between the top of the receptacle rim and an edge of the necked portion. A plurality of vertical ribs are formed integral with the shell. These ribs have sufficient length to bridge this axial distance and can be attached to the upper end of the receptacle rim by ultrasonic welding so as to fix the shell to the receptacle. Because the attachment of the ribs to the receptacle occurs only at spaced intervals about the periphery of the receptacle, the ribs provides weak "breakaway" points so as to facilitate removal of the shell from the receptacle. In one embodiment, a flat, annular gasket is disposed between the lower end face of the shell and the support plate, the inner periphery of this gasket being squeezed between an inner foot of the shell and the filtering membrane whereas the outer periphery of the gasket is squeezed by an outer foot of the shell and rests on the rim of the support plate, this gasket thus providing, on the one hand, a liquid-tight seal between the shell and the filtering membrane and, on the other hand, an air-tight seal between the shell and the support plate. In other embodiments, the support plate comprises an upstanding tongue which is received between the inner foot and the outer foot of the shell whereas the flat, annular gasket is replaced by a gasket which has been put in a space between the rim and the tongue of the receptacle.

US 4 678 576 A discloses a device for similar purposes, but not for a liquid under pressure. The disclosed device comprises, as intake body, an open ended upper body, and, as a drainage body, a cup-shaped receptacle and a support plate, a locking rim being further provided to lock the intake body and the drainage body. The support plate is sandwiched between an upper collar portion of a collar included in the receptacle and an internal shoulder of a necked portion including the upper body, the ring being engaged respectively, by its internal thread, with the external thread of the lower portion of the collar of the receptacle and, by an upper rim, with the lower external shoulder of a split flange included in the upper body. In one embodiment, two O-rings are provided respectively on one side and on the other of the support plate whereas in another embodiment, a single H-shaped gasket is provided.

The invention relates to a device of the same kind as known through French patent 2 677 664, but simpler, more convenient and more economical, both in manufacture and in use.

To that end it proposes a device for microbiological examination of a sample of liquid under pressure, having an intake body, a filtering membrane and a drainage body, said intake body having a reservoir, in one wall of which a liquid input aperture is made, said membrane closing said reservoir, said drainage body having means of supporting said membrane on the opposite side from said reservoir and a liquid output aperture, said intake body and said drainage body having integrally moulded mutual locking means; characterised in that said membrane is gripped annularly at the periphery between a first member forming part of said intake body and a second member forming part of said drainage body with one out of said first member and said second member having an elastomer seal by means of which it comes into contact with said membrane, and in that said locking means are adapted to allow the opening of said device by requiring only a separation movement between said first member and said second member, said locking means having means of axial latching between the intake body and the drainage body, one out of the latter having at least one axially oriented latching tab while the other has means of receiving said latching tab, which extends projecting from the edge of a skirt forming part of that one out of said intake body and said drainage body which includes it.

Thus, unlike the aforementioned earlier device known through French patent 2 677 664, where the locking means are constituted by thread elements, the opening of the device according to the invention is performed with no rotational movement between the intake body and the drainage body.

The device according to the invention therefore makes it possible to eliminate any risk of creasing the membrane at the time of opening the device where it is then in the wet state.

Furthermore, the elastomer seal, although it is present only on one of the faces of the membrane, makes it possible to obtain sealing on both faces of the membrane, that is to say both with the first member and with the second member, from the simple fact that said members grip the membrane, that is to say they are held close to one another, so that it is not necessary, in order to close the device according to the invention, to perform a rotational movement, unlike the above-mentioned earlier device known through French patent 2 677 664 which requires, so that the sealing lip on the intake body is applied with the required intensity on the drainage body, that assembly is carried out by screwing with a considerable torque.

The device according to the invention is therefore much simpler and more convenient to use than the above-mentioned earlier device known through French patent 2 677 664, and is

furthermore simpler to manufacture, since there is no need, on the one hand, to make provision for achieving sealing between the membrane and the intake body by welding, and, on the other hand, sealing around the membrane between the intake body and the drainage body, given that, in the device according to the invention, the gripping of the membrane between the first member and the second member makes it possible to obtain these two instances of sealing directly.

Thanks to the fact that the locking means have means of axial latching between the intake body and the drainage body, the assembly of the device according to the invention is particularly simple, since it is sufficient to bring the intake body and the drainage body together in order to lock them by latching.

It should be noted that the elastomer seal, on account of its elasticity, takes up the play necessary for enabling latching, so that, once assembled, the intake body and the drainage body are held with no axial play with respect to one another.

The fact that one out of the intake body and the drainage body has at least one axially oriented latching tab while the other has means of receiving said latching tab, is preferred for reasons of simplicity and convenience, both in manufacture and in use.

Preferably, the membrane is held exclusively on account of it being gripped annularly at the periphery between said first member and said second member.

The manufacture and use of the device according to the invention are thus particularly simple, since no operation such as the sealing of the membrane existing in the earlier device has to be implemented, while, after opening of the device according to the invention, the membrane, which is fixed neither to the first member nor to the second member, can be recovered directly, for example with sterile tweezers in order to be put into culture in a conventional Petri dish.

Preferably again, said latching tab is connected to the remainder of that one out of said intake body and said drainage body which includes it, by a breakable zone.

The release of the locking means between the latching body and the drainage body can thus be performed by simple breaking of the latching tab, or even of a number of latching tabs if the device according to the invention has more than one.

According to other preferred characteristics, said drainage body has a circular table provided at its centre with means of supporting said membrane and having, around said support means, a wall having a surface situated facing said elastomer seal, which forms part of said intake body, said membrane being squeezed between said surface and said seal.

This arrangement offers in effect the advantage of being relatively simple to implement and of obtaining excellent results as regards sealing.

According to other preferred characteristics, for the same reasons, said output aperture of the drainage body is in the continuation of the internal passage of an output pipe disposed coaxially.

Preferably, said drainage body has, around said output pipe, an annular rib tapering towards its end.

This rib makes it possible in particular to drain the device according to the invention by placing it directly on a vacuum flask with said output pipe engaged in the central hole of the stopper of said flask and said annular rib resting on this stopper.

The invention also relates, in a second aspect, to a method for thus draining the device according to the invention.

The explanation of the invention will now be continued with the description of an example embodiment, given below as a non-limitative illustration, with reference to the accompanying drawings. In these:

- Figure 1 is an elevational view of a device in accordance with the invention;
- Figure 2 is a sectional elevational view of this device;
- Figures 3 and 4 are similar views but showing, respectively, only the intake body and the drainage body;
- Figure 5 is an enlargement of the part of Figure 2 situated at the bottom right;
- Figure 6 is a partial sectional elevational view of the seal with which the intake body is provided;
- Figure 7 is a sectional elevational view showing how the device according to the invention is used for sampling the liquid to be examined;
- Figure 8 is a similar view showing how the device in accordance with the invention is drained, after a sample has been taken, by means of a syringe;
- Figure 9 is the corresponding top view, a second possible location for the syringe being shown with a syringe partially illustrated;
- Figure 10 is a view similar to Figure 8, where the drainage is performed with a vacuum flask;

- Figures 11 and 12 are sectional elevational views showing how the latching tabs are broken off the intake body in order to release the latter from the drainage body;
- Figure 13 shows how the membrane is recovered with tweezers after this release; and
- Figure 14 shows how the membrane is deposited in a Petri dish.

The device 1 for microbiological examination of a sample of liquid under pressure shown in the drawings, and notably in Figures 1 and 2, has in general terms a symmetry of revolution around a central axis. It has an intake body 2, a drainage body 3 and a filtering membrane 4.

The intake body 2 has a reservoir 5, a skirt 6 which is connected externally to the reservoir 5 and four latching tabs 7 which extend projecting from the skirt 6, in an axial direction.

The reservoir 5 has an end wall 8 and a lateral wall 9.

Two diametrically opposite pipes 10 extend projecting outward from the lateral wall 9, above the skirt 6, each of these pipes constituting a female Luer connector adapted to receive internally a male Luer connector, as will be explained below with the help of Figure 7, the passage internal to each pipe 10 being continued by an aperture 11 made in the wall 9, this aperture being in immediate proximity to the end wall 8.

The lateral wall 9 finishes at the end opposite the end wall 8 in an edge forming part of a seal 13, a groove 14 being made to that effect in the rigid part of the wall 9, as will be explained in more detail subsequently with the help of Figures 2, 3 and 6.

The skirt 6 is connected to the reservoir 5 by the outside of the lateral wall 9, at a level situated between the groove 14 and the pipes 10, the skirt 6 having a truncated-cone shaped wall 15 and a cylindrical wall 16, the skirt 6 being connected to the wall 9 by the small-diameter end of the wall 15 while the connection between the walls 15 and 16 is made by the large-diameter end of the wall 15, the connection between the walls 15 and 16 being situated approximately at the level of the edge of the wall 9.

Each of the latching tabs 7 has a general outline in the form of a trapezium symmetrical with respect to the axial direction, the side forming the free end 18 of the tab 7 being parallel to the one by which this tab is connected to the skirt 6, and more precisely to the edge of the wall 16, the tab 7 narrowing steadily between its connection to the skirt 6 and its free end.

On either side of each tab 7, a notch 17 is made in the wall 16, over a certain distance from the edge thereof.



Each tab 7 has, from its free end 18, an internal surface 19 which is straight, that is to say parallel to the axial direction, as far as a dihedral 20 from which the surface 19 is inclined inward and towards the wall 16.

As for the external surface 21 of each tab 16, this is inclined outward and towards the wall 16, the surface 21 extending between the surface 18 and a transversely oriented surface 22 which connects the surface 21 and a groove 23 situated between an external shoulder 24 whose surface 22 constitutes the edge and a surface 25 offset inward with respect to the surface 21, the surface 25 being in the continuation of the external surface of the wall 16.

It should be noted that the portion of each tab 7 situated between the bottom of the groove 23 and the edge of the wall 16 has a thickness which is a minimum at the level of the dihedral 20.

Consequently, it is in the region of the dihedral 20 that the tab 7 breaks if a sufficiently large pressure is exerted on the surface 21, and more generally if there is exerted on the tab 7 a radial force directed inward, the force necessary for breaking the tab 7 being smaller the closer it is applied to the end surface 18.

As can be seen more particularly in Figure 1, the surface 21 has edges parallel to the axial direction, each tab 7 having a notch 26 with an L-shaped profile between the lateral edges of the surface 21 and the lateral edges of the tab 7.

As can be seen better in Figure 4, the drainage body 3 has a circular table 30 and a skirt 31 disposed in a step around the table 30.

The latter has an annular transverse wall 32 delimited on the opposite side from the skirt 31 by a surface 33 which is flat in the main but having a slight bevel towards the outside.

The internal periphery of the wall 32 is connected to a wall 34 delimited, on the side of the surface 33, by a surface 35 which is concave in the main, offset with respect to the surface 32 in the axial direction, towards the skirt 31, the perimeter of the surface 35 and the internal periphery of the surface 33 being connected by a slightly truncated-cone shaped surface 36.

The wall 34 is connected centrally to a pipe 37 whose internal passage is extended into the wall 34 by an output aperture 38, concentric drainage channels 39 being put into the wall 34 from the surface 35, radially oriented channels (not visible in the drawings) also being made, with the same depth as the channels 39, these radial channels opening of course into the output aperture 38, through which, therefore, there flows out all the liquid drained by the channels made in the wall 34 hollowed out with respect to the surface 35.

At the junction between the walls 32 and 34 there is situated an annular rib 40 which projects with respect to the walls 32 and 34 on the side of the skirt 31, this rib tapering towards its free end in a V-shaped profile, so that this end constitutes a sharp edge.

The table 30 also has a tubular lateral wall 41 which is connected by one end to the wall 32 while, by the other end, it is connected to the skirt 31.

The latter has a transversely oriented annular wall 42 and an axially oriented cylindrical wall 43, the wall 42 being connected by one of its ends to the wall 41 and by the other to the wall 43.

In the wall 42, in proximity to the wall 41, four openings 44 are made, which have between them the same angular spacing as between the latching tabs 7, that is to say they are spaced out from one another by 90°, these openings having an outline corresponding to the largest outline of the tabs 7, so that the latter can each pass through a respective opening 44.

Each opening 44 is bordered on the external side by an axially oriented tooth 45 projecting on the opposite side from the table 30.

Each tooth 45 extends projecting over a height corresponding to the depth of the groove 23 and has a thickness less than the width of the groove 23, the distance separating each tooth 45 from the wall 43 being greater than the thickness of the shoulder 24 (see Figure 5).

At the level of each opening 44, the wall 43 has a notch 46 of general rectangular form with rounded corners, extending over approximately two thirds of the height of the wall 43 and over a width which is approximately twice the width of the latching tabs 7.

The wall 43 also has four notches 47, each disposed halfway between two successive notches 46, the notches 47 having a rounded form whose maximum height corresponds approximately to one third of the height of the wall 43.

The drainage body 3 also has a porous pad 48 (not depicted in Figure 4), which has a constant thickness with two opposite surfaces of the same form as the surface 35, its diameter and thickness being the same as those of the surface 36.

When the filtration body 2, the drainage body 3 and the membrane 4 are assembled, as shown notably in Figures 1 and 2, the membrane 4 is gripped between the edge of the lateral wall 9 of the reservoir 5 of the intake body 2 and the surface 33 of the wall 32 of the circular table 30 of the drainage body 3, the bodies 2 and 3 being locked to one another by virtue of the latching tabs 7 and the skirt 31, which are mutually disposed as can be seen more particularly in Figure 5.

It should be noted that the tooth 45 of the wall 42 fits into the groove 23 of the tab 7 and that the shoulder 24 of this tab fits into the space situated between the wall 43 and the tooth 45, so that the cooperation between the shoulder 24 and the tooth 45 provides an extremely powerful locking of the tab 7 in the skirt 31, capable of withstanding relatively large forces tending to move the bodies 2 and 3 away from one another.

It should also be noted that the end 18 of the tab 7 is recessed with respect to the free end of the wall 43, so that, when the device 1 is put down on a surface with the drainage body 3 at the bottom, it is by means of the skirt 31 thereof that the device 1 rests on this surface, no force being exerted for this reason on the tabs 7, which therefore do not risk being broken accidentally.

As can be seen in Figure 2, when the device 1 is assembled, the seal 13, and more particularly the cushion thereof, is highly compressed compared with the off-load form of this seal shown in Figure 6.

As indicated above, this seal has a T-shaped general profile whose longitudinal branch forms a rib 50 designed to be inserted into the groove 14 and whose transverse branch forms a cushion 51 designed to enter into contact with the membrane 4.

The free end of the cushion 51 has a central slot 52 which makes it possible to release two annular lips 53 allowing the best cooperation of the cushion 51 with the membrane 4.

It should be noted that the junction between the rib 50 and the cushion 51 is made by a straight surface on the internal side while, on the external side, there is a bevel 54.

This bevel in fact corresponds to a chamfered lip 55 at the external periphery of the end of the rigid part of the wall 9, this chamfered lip making it possible to laterally contain the cushion 51 on the external side in order that it flows mainly inward, that is to say towards the chamber delimited by the membrane 4 and the reservoir 5.

The intake body 2 is obtained, with the exception of the seal 13, by moulding of a relatively rigid and transparent plastic, and then there is moulded, on to this piece, the seal 13, which is made of elastomer, this over-moulding being carried out in the example illustrated by bi-injection.

The part of the drainage body 3 depicted in Figure 4 is also made of relatively rigid moulded plastic, here white in colour, this part being next equipped, by simple fitting, with the porous pad 48.

In order to assemble the intake body 1, the drainage body 3 and the membrane 4, the latter is put on the table 30, concentrically therewith, then the intake body 2 is positioned facing the

drainage body 3 with the latching tabs 7 aligned with the openings 44, then the body 2 is pressed hard towards the body 3 so that the tabs 7 engage in the openings 44 flexing slightly by virtue of the inclined surface 21 which acts as a ramp, the force exerted allowing the surface 22 of the shoulder 24 to get over the tooth 45 at the end of the pushing in movement, by virtue of the spring of the tabs 7, the seal 13 next relaxing slightly so that the play between the tabs 7 and the skirt 31 is completely taken up, the elasticity of the seal 13, which is then compressed, maintaining the locking thus obtained.

It should be noted that the maintaining of the seal in the compressed state allows it to offer excellent sealing between the membrane 4 and the edge of the wall 9, and furthermore, by reaction, between the membrane 4 and the surface 33.

It should also be noted that the internal surface of the wall 16 has localized areas of extra thickness 27 (Figure 3) coming into contact with the external surface of the wall 41, which provides a lateral wedging between these surfaces, which are of similar diameter, and more generally between the bodies 2 and 3.

Finally it should be noted that, once the device 1 has been assembled in this way, it is possible to package it and sterilize it with a gas such as ETO or by irradiation.

Of course, before packaging the assembled device 1 and sterilizing it, each of the pipes 10 and 37 is equipped with a stopper.

There will now be explained how the sampling of a liquid under pressure is carried out with the device 1.

First of all the stopper blocking off one of the pipes 10 and the stopper blocking off the pipe 37 are removed, then the unstoppered pipe 10 is connected to a source of liquid under pressure, for example using, as shown in Figure 7, a sampling connector 60 having a male Luer tip 61, which is inserted into the passage of the unstoppered pipe 10 and the valve 62 of the connector 60 is manipulated, so that the chamber formed by the reservoir 5 and the membrane 4 is raised to the same pressure as the liquid, for example 3 bars, the liquid entering the reservoir 5 through the aperture 11 and leaving the reservoir by passing through the membrane 4, which comes to rest on the porous pad 48, the liquid which has passed through the membrane 4 being guided by the channels 39 to the aperture 38, the liquid leaving the device 1 by the pipe 37, a graduated container being preferably disposed under the device 1 in order to recover the liquid coming out of

the pipe 37 in order to know when the volume required for the sample has passed through the membrane 4.

When this volume has been reached, the valve 62 is closed and the device 1 is removed from the connector 60, then there is put in place, in the unstoppered pipe 10, an air sterilization filter 63 (depicted in Figure 10 but not in Figure 8), and the drainage of the liquid still present notably in the reservoir 5 is next carried out, by suction through the output aperture 38.

In the example shown in Figure 8, the drainage is performed with a syringe or pump 64 having a connector 65 provided with a suction tip 66 which has been inserted into the passage of the pipe 37, the liquid sucked out by the tip 66 being expelled by the tip 67 when the shaft 69 is pushed into the body 68, by pressing on the plunger 70.

It should be noted that the notches 47 made in the wall 43 make it possible to correctly position the pump or syringe 64 in relation to the device 1, in four positions at 90° from one another, two of these positions being shown in Figure 8.

Another possibility for extracting the liquid remaining in the device 1 after sampling, is to use a vacuum flask, as shown in Figure 10.

The vacuum flask 71 illustrated has a glass body 72 having, at the level of its neck, a pipe 73 connected, in a manner not depicted, to a vacuum pump, and, at the top of this neck, a flexible stopper 74 with a central aperture 75 made in it, the flask 71 being of a type which is commonly found in practice.

The device 1 is simply put down on the stopper 74, with the pipe 37 engaged in the aperture 75 and the rib 40 supported on the top of the stopper 74.

On account of the tapered profile of the rib 40, the latter locally deforms the stopper 74 and provides sealing which makes it possible to suck out the residual liquid, as drawn.

Once the liquid remaining in the device 1 has been emptied therefrom, the device 1 can be opened, which is performed by breaking the four latching tabs 7, by simple pressure on said tabs through the respective notches 46, as explained above and illustrated in Figures 11 and 12.

It is then possible to remove the intake body 2 from the drainage body 3 and pick up the membrane 4, for example with sterile tweezers 80, as shown in Figure 13, then deposit the membrane through which the sample to be examined has passed, in a Petri dish 81, as shown in Figure 14, then carry out conventionally the incubation of the membrane/Petri dish assembly.

It should be noted that the concavity of the surface 35 has been calculated so that the ratio of the difference between the length of the arc corresponding to the profile, in a diametral plane, of the surface of the pad 48 facing the membrane 4 and between the length of the chord of this arc, over the latter length, corresponds to the coefficient of expansion of the membrane 4 between the dry state and the wet state.

The result thereof is that the expansion of the membrane 4, when it changes from the dry state to the wet state, corresponds precisely to the difference in length between the arc corresponding to the above-mentioned profile and the chord of this arc, so that, in the wet state, the membrane 4 rests perfectly on the pad 48, with no creases. The pad 48 therefore provides a particularly effective support for the membrane 4 when it is subjected to the difference in pressure which allows the liquid to flow through it.

Moreover, when the user recovers the membrane 4 with the tweezers 80 as shown in Figure 13, this membrane has a concave form, on the side where the reservoir 5 is situated, that is to say on the side where any micro-organisms retained by the membrane at the time of sampling are present, the curvature of the membrane 4 thus being in the correct direction where putting it down on the surface of the culture medium 82 in the dish 81 is concerned.

This is because, when the membrane 4 is positioned on the dish 81, it is the convex side of the membrane 4 which faces the surface of the medium 82, so that, putting down the membrane 4 on the medium 82 from a portion of the membrane opposite the tweezers 80 and moving them so that the membrane progressively comes into contact with the medium 82 to the place where it is held by the tweezers. The risk that the membrane has one or more hollows on the opposite side from the medium 82, and therefore the risk that it develops one or more pocket(s) of air between the membrane 4 and the medium 82, are thus zero or at any rate minimal.

The culture medium 82 in the dish 81 illustrated in Figure 14 is a culture medium containing agar-agar, used in the solid state after having been poured into the dish hot.

If it is wished to use a liquid culture medium, it is possible to replace the Petri dish 81 with a similar dish but one where the agar-agar culture medium 82 is replaced by an absorbent pad impregnated with liquid culture medium.

Another possibility, rather than culturing the micro-organisms outside the device 1, is to inject liquid culture medium therein using one of the pipes 10, then to drain the excess culture

medium using the pipe 37, and to next put the device 1 to incubate directly, the membrane 4 being recovered only in order to identify and count the micro-organisms after incubation.

In such a case, there is an advantage in using a liquid culture medium which is slightly more concentrated than the conventional media since there always remains, notably in the pad 48, a certain amount of the sampled liquid which mixes with the injected culture medium which is therefore diluted.

In variants, not depicted, it is the drainage body 3, and not the intake body 2, which has the elastomer seal such as the seal 13 described above; the male and female latching elements between the bodies 2 and 3 are provided respectively on the drainage body 3 and the intake body 2, rather than the reverse; and/or use is made of latching means of different type, locking means having hinge means between the bodies 2 and 3 and latching means opposite the hinge means, or means of locking other than by latching.

## CLAIMS

1. A device for microbiological examination of a sample of liquid under pressure, having an intake body, a filtering membrane and a drainage body, said intake body having a reservoir, in one wall of which a liquid input aperture is made, said membrane closing said reservoir, said drainage body having means of supporting said membrane on the opposite side from said reservoir and a liquid output aperture, said intake body and said drainage body having integrally moulded mutual locking means; characterised in that said membrane is gripped annularly at the periphery between a first member forming part of said intake body and a second member forming part of said drainage body with one out of said first member and said second member having an elastomer seal by means of which it comes into contact with said membrane, and in that said locking means are adapted to allow the opening of said device by requiring only a separation movement between said first member and said second member, said locking means having means of axial latching between the intake body and the drainage body, one out of the latter having at least one axially oriented latching tab while the other has means of receiving said latching tab, which extends projecting from the edge of a skirt forming part of that one out of said intake body and said drainage body which includes it.

2. A device according to Claim 1, characterised in that the membrane is held exclusively on account of it being gripped annularly at the periphery between said first member and said second member.

3. A device according to Claim 1, characterised in that said seal is moulded on to that one out of said first member and said second member which includes it.

4. A device according to Claim 1, characterised in that it is the first member which has said elastomer seal.

5. A device according to Claim 1, characterised in that it is the first member which has said elastomer seal and said first member forms a lateral wall of said reservoir of the intake body, said wall finishing at one end in an edge forming part of said seal.

6. A device according to Claim 1, characterised in that it is the first member which has said elastomer seal and said first member forms a lateral wall of said reservoir of the intake body, said wall finishing at one end in an edge forming part of said seal and a groove is made at the end of a rigid part of said lateral wall while said seal has a T-shaped profile whose longitudinal



branch forms a rib inserted into said groove and whose transverse branch forms a cushion which is in contact with the membrane.

7. A device according to Claim 1, characterised in that it is the first member which has said elastomer seal and said first member forms a lateral wall of said reservoir of the intake body, said wall finishing at one end in an edge forming part of said seal and a groove is made at the end of a rigid part of said lateral wall while said seal has a T-shaped profile whose longitudinal branch forms a rib inserted into said groove and whose transverse branch forms a cushion which is in contact with the membrane and there is a bevel between the rib and the cushion on the external side, while, on the internal side, the rib and the cushion are connected by a straight surface.

8. A device according to Claim 1, characterised in that it is the first member which has said elastomer seal and said first member forms a lateral wall of said reservoir of the intake body, said wall finishing at one end in an edge forming part of said seal and a groove is made at the end of a rigid part of said lateral wall while said seal has a T-shaped profile whose longitudinal branch forms a rib inserted into said groove and whose transverse branch forms a cushion which is in contact with the membrane and said cushion has two annular lips.

9. A device according to Claim 1, characterised in that said latching tab is connected to the remainder of that one out of said intake body and said drainage body which includes it, by a breakable zone.

10. A device according to Claim 1, characterised in that said latching tab is connected to the remainder of that one out of said intake body and said drainage body which includes it, by a breakable zone and said breakable zone is situated in the region of a dihedral in one of the surfaces of said latching tab.

11. A device according to Claim 1, characterised in that said latching tab is connected to the remainder of that one out of said intake body and said drainage body which includes it, by a breakable zone and said breakable zone is situated in the region of a dihedral in one of the surfaces of said latching tab and said surface having a dihedral is situated on the internal side of the latching tab.

12. A device according to Claim 1, characterised in that that one out of said intake body and said drainage body which has means of receiving said latching tab has a wall oriented transversely and provided with an opening through which the latching tab can pass, means being provided for preventing the withdrawal of the tab once it has been pushed right into the opening.

13. A device according to Claim 1, characterised in that that one out of said intake body and said drainage body which has means of receiving said latching tab has a wall oriented transversely and provided with an opening through which the latching tab can pass, means being provided for preventing the withdrawal of the tab once it has been pushed right into the opening and said means for preventing the withdrawal of the latching tab are provided on the latter and on said wall.

14. A device according to Claim 1, characterised in that that one out of said intake body and said drainage body which has means of receiving said latching tab has a wall oriented transversely and provided with an opening through which the latching tab can pass, means being provided for preventing the withdrawal of the tab once it has been pushed right into the opening and said means for preventing the withdrawal of the latching tab are provided on the latter and on said wall and said means for preventing the withdrawal of the latching tab have, on said wall, a tooth oriented axially and bordering said opening and having, on said latching tab, a groove adapted to accommodate said tooth.

15. A device according to Claim 1, characterised in that that one out of said intake body and said drainage body which has means of receiving said latching tab has a wall oriented transversely and provided with an opening through which the latching tab can pass, means being provided for preventing the withdrawal of the tab once it has been pushed right into the opening and said transversely oriented wall is connected to a lateral wall extending on the opposite side from that one out of said intake body and said drainage body which has the latching tab, with the dimension in the axial direction of said lateral wall being greater than the dimension in the axial direction of the latching tab.

16. A device according to Claim 1, characterised in that a notch is made in said lateral wall at the level of said opening, to make it possible to press on said latching tab.

17. A device according to Claim 1, characterised in that it is the intake body which has the latching tab, and in that it is the drainage body which has the means of receiving said latching tab.

18. A device according to Claim 1, characterised in that one out of said intake body and said drainage body has a number of said latching tabs.

19. A device according to Claim 1, characterised in that one out of said intake body and said drainage body has four latching tabs.

20. A device according to Claim 1, characterised in that said locking means comprise exclusively said axial latching means.

21. A device according to Claim 1, characterised in that said drainage body has a circular table provided at its centre with means of supporting said membrane and having, around said support means, a wall having a surface situated facing said elastomer seal, which forms part of said intake body, said membrane being squeezed between said surface and said seal.

22. A device according to Claim 1, characterised in that said drainage body has a circular table provided at its centre with means of supporting said membrane and having, around said support means, a wall having a surface situated facing said elastomer seal, which forms part of said intake body, said membrane being squeezed between said surface and said seal and said support means have a concave surface facing said membrane.

23. A device according to Claim 1, characterised in that the ratio of the difference between the length of the arc corresponding to the profile, in a diametral plane, of said surface of said support means and between the length of the chord of this arc, over the latter length, corresponds to the coefficient of expansion of said membrane between the dry state and the wet state.

24. A device according to Claim 1, characterised in that said drainage body has a circular table provided at its centre with means of supporting said membrane and having, around said support means, a wall having a surface situated facing said elastomer seal, which forms part of said intake body, said membrane being squeezed between said surface and said seal and said support means are formed by a porous pad.

25. A device according to Claim 1, characterised in that said drainage body has a circular table provided at its centre with means of supporting said membrane and having, around said support means, a wall having a surface situated facing said elastomer seal, which forms part of said intake body, said membrane being squeezed between said surface and said seal and said support means are formed by a porous pad and said drainage body has drainage channels under said porous pad, said drainage channels opening into said output aperture.

26. A device according to Claim 1, characterised in that said drainage body has a circular table provided at its centre with means of supporting said membrane and having, around said support means, a wall having a surface situated facing said elastomer seal, which forms part of said intake body, said membrane being squeezed between said surface and said seal and the

external diameter of said circular table corresponds substantially to the internal diameter of a skirt included in said intake body, said skirt encircling said circular table.

27. A device according to Claim 1, characterised in that said drainage body has a circular table provided at its centre with means of supporting said membrane and having, around said support means, a wall having a surface situated facing said elastomer seal, which forms part of said intake body, said membrane being squeezed between said surface and said seal and the external diameter of said circular table corresponds substantially to the internal diameter of a skirt included in said intake body, said skirt encircling said circular table and areas of extra thickness for wedging are provided between said circular table and said skirt.

28. A device according to Claim 1, characterised in that said drainage body has a circular table provided at its centre with means of supporting said membrane and having, around said support means, a wall having a surface situated facing said elastomer seal, which forms part of said intake body, said membrane being squeezed between said surface and said seal and said drainage body has a skirt disposed in a step with respect to said circular table.

29. A device according to Claim 1, characterised in that said drainage body has a circular table provided at its centre with means of supporting said membrane and having, around said support means, a wall having a surface situated facing said elastomer seal, which forms part of said intake body, said membrane being squeezed between said surface and said seal and said drainage body has a skirt disposed in a step with respect to said circular table and said skirt has means of latching with said intake body.

30. A device according to Claim 1, characterised in that said drainage body has a circular table provided at its centre with means of supporting said membrane and having, around said support means, a wall having a surface situated facing said elastomer seal, which forms part of said intake body, said membrane being squeezed between said surface and said seal and said drainage body has a skirt disposed in a step with respect to said circular table and said skirt of the drainage body has at least one notch adapted to allow the placing of a drainage syringe.

31. A device according to Claim 1, characterised in that said output aperture of the drainage body is in the continuation of the internal passage of a coaxially disposed output pipe.

32. A device according to Claim 1, characterised in that said output aperture of the drainage body is in the continuation of the internal passage of a coaxially disposed output pipe and said drainage body has, around said output pipe, an annular rib tapering towards its end.

33. A method for draining a device according to Claim 1, characterised in that said output aperture of the drainage body is in the continuation of the internal passage of a coaxially disposed output pipe and said drainage body has, around said output pipe, an annular rib tapering towards its end and it is placed on a vacuum flask with said output pipe engaged in the central hole of the stopper of said flask and said annular rib resting on this stopper.

## ABSTRACT

This concerns a device whose filtering membrane is gripped annularly at the periphery between a first member forming part of an intake body and a second member forming part of a drainage body with one out of the first member and second member having an elastomer seal by means of which it comes into contact with the membrane, and whose locking means are adapted to allow the opening of the device by requiring only a separation movement between said first member and said second member.

The drainage method proposes directly placing the device on a vacuum flask, the sealing with regard to the stopper of said flask being obtained by a rib tapering towards its end.

## PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

RINUÿ, SANTARELLI  
14, avenue de la Grande Armée  
B.P. 237  
F-75822 Paris Cedex 17  
FRANCE

Date of mailing (day/month/year) 20 December 2001 (20.12.01)	<b>IMPORTANT NOTIFICATION</b>
Applicant's or agent's file reference BIF022365/FL	
International application No. PCT/IB00/01902	International filing date (day/month/year) 18 December 2000 (18.12.00)

## 1. The following indications appeared on record concerning:

☒ the applicant      ☐ the inventor      ☐ the agent      ☐ the common representative

Name and Address MILLIPORE S.A. 39, route industrielle de la Hardt F-67120 Molsheim France	State of Nationality FR	State of Residence FR
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

## 2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☒ the person      ☐ the name      ☐ the address      ☐ the nationality      ☐ the residence

Name and Address MILLIPORE 39, route industrielle de la Hardt F-67120 Molsheim France	State of Nationality FR	State of Residence FR
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

## 3. Further observations, if necessary:

## 4. A copy of this notification has been sent to:

<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned
<input type="checkbox"/> the International Searching Authority	<input checked="" type="checkbox"/> the elected Offices concerned
<input type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer S. Buttay
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

## PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner  
US Department of Commerce  
United States Patent and Trademark  
Office, PCT  
2011 South Clark Place Room  
CP2/5C24  
Arlington, VA 22202  
ETATS-UNIS D'AMERIQUE  
in its capacity as elected Office

Date of mailing (day/month/year) 02 August 2001 (02.08.01)	
International application No. PCT/IB00/01902	Applicant's or agent's file reference BIF022365/FL
International filing date (day/month/year) 18 December 2000 (18.12.00)	Priority date (day/month/year) 24 December 1999 (24.12.99)
Applicant LEMONNIER, Jean	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:  
12 May 2001 (12.05.01)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was  
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Pascal Piriou Telephone No.: (41-22) 338.83.38
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## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>BIF022365/FL</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/IB 00/01902</b>	International filing date (day/month/year) <b>18/12/2000</b>	(Earliest) Priority Date (day/month/year) <b>24/12/1999</b>
Applicant <b>MILLIPORE S.A. et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

## 1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

2

☐ None of the figures.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

IB 00/01902

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0059809	A	15-09-1982	AU 541787 B	17-01-1985
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			WO 9405395 A	17-03-1994

# INTERNATIONAL SEARCH REPORT

In. ational Application No  
PCT/IB 00/01902

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 C12M1/12

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 C12M B01D B01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 059 809 A (SYBRON CORP) 15 September 1982 (1982-09-15)	1-6, 23, 33
Y	page 5, line 19 - line 34; claims; figures 1,2	9, 10, 14, 20, 21, 23, 24, 27
X	US 4 678 576 A (LEONCAVALLO RICHARD A) 7 July 1987 (1987-07-07)	1-4, 23
Y	figures 1,2	9
Y	EP 0 319 701 A (HEILMEIER & WEINLEIN) 14 June 1989 (1989-06-14)	23, 24
Y	US 4 319 996 A (VINCENT MONTY E ET AL) 16 March 1982 (1982-03-16)	23, 24, 27
	claims; figures	
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*G\* document member of the same patent family

Date of the actual completion of the international search

19 February 2001

Date of mailing of the international search report

23/02/2001

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
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Authorized officer

Coucke, A

# INTERNATIONAL SEARCH REPORT

In. ational Application No  
PCT/IB 00/01902

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 688 460 A (RUSCHKE RICK R) 18 November 1997 (1997-11-18) figures	9,10,14, 20,21
A	US 5 308 483 A (SKLAR ERIC ET AL) 3 May 1994 (1994-05-03)	

REPLACED BY  
ART 34 AMB

The invention relates to a device of the same kind, but simpler, more convenient and more economical, both in manufacture and in use.

To that end it proposes a device for microbiological examination of a sample of liquid under pressure, having an intake body, a filtering membrane and a drainage body, said intake body having a reservoir, in one wall of which a liquid input aperture is made, said membrane closing said reservoir, said drainage body having means of supporting said membrane on the opposite side from said reservoir and a liquid output aperture, said intake body and said drainage body having integrally moulded mutual locking means; characterised in that said membrane is gripped annularly at the periphery between a first member forming part of said intake body and a second member forming part of said drainage body with one out of said first member and said second member having an elastomer seal by means of which it comes into contact with said membrane, and in that said locking means are adapted to allow the opening of said device by requiring only a separation movement between said first member and said second member.

Thus, unlike the aforementioned earlier device, where the locking means are constituted by thread elements, the opening of the device according to the invention is performed with no rotational movement between the intake body and the drainage body.

The device according to the invention therefore makes it possible to eliminate any risk of creasing the membrane at the time of opening the device where it is then in the wet state.

Furthermore, the elastomer seal, although it is present only on one of the faces of the membrane, makes it possible to obtain sealing on both faces of the membrane, that is to say both with the first member and with the second member, from the simple fact that said members grip the membrane, that is to say they are held close to one another, so that it is not necessary, in order to close the device according to the invention, to perform a rotational movement, unlike the above-mentioned earlier device which requires, so that the sealing lip on the intake body is applied with the required intensity on the drainage body, that assembly is carried out by screwing with a considerable torque.

The device according to the invention is therefore much simpler and more convenient to use than the above-mentioned earlier device, and is furthermore simpler to manufacture, since there is no need, on the one hand, to make provision for achieving sealing between the membrane and the intake  
5 body by welding, and, on the other hand, sealing around the membrane between the intake body and the drainage body, given that, in the device according to the invention, the gripping of the membrane between the first member and the second member makes it possible to obtain these two instances of sealing directly.

10 Preferably, the membrane is held exclusively on account of it being gripped annularly at the periphery between said first member and said second member.

The manufacture and use of the device according to the invention are thus particularly simple, since no operation such as the sealing of the  
15 membrane existing in the earlier device has to be implemented, while, after opening of the device according to the invention, the membrane, which is fixed neither to the first member nor to the second member, can be recovered directly, for example with sterile tweezers in order to be put into culture in a conventional Petri dish.

20 According to other preferred characteristics, said locking means have means of axial latching between the intake body and the drainage body.

The assembly of the device according to the invention is thus particularly simple, since it is sufficient to bring the intake body and the drainage body together in order to lock them by latching.

25 It should be noted that the elastomer seal, on account of its elasticity, takes up the play necessary for enabling latching, so that, once assembled, the intake body and the drainage body are held with no axial play with respect to one another.

30 Preferably, for reasons of simplicity and convenience, both in manufacture and in use, one out of said intake body and said drainage body has at least one axially oriented latching tab while the other has means of receiving said latching tab.

there always remains, notably in the pad 48, a certain amount of the sampled liquid which mixes with the injected culture medium which is therefore diluted.

In variants, not depicted, it is the drainage body 3, and not the intake body 2, which has the elastomer seal such as the seal 13 described above; the male and female latching elements between the bodies 2 and 3 are provided respectively on the drainage body 3 and the intake body 2, rather than the reverse; and/or use is made of latching means of different type, locking means having hinge means between the bodies 2 and 3 and latching means opposite the hinge means, or means of locking other than by latching.

CLAIMS

1. Device for microbiological examination of a sample of liquid under pressure, having an intake body, a filtering membrane and a drainage body, said intake body having a reservoir, in one wall of which a liquid input aperture is made, said membrane closing said reservoir, said drainage body having means of supporting said membrane on the opposite side from said reservoir and a liquid output aperture, said intake body and said drainage body having integrally moulded mutual locking means; characterised in that said membrane (4) is gripped annularly at the periphery between a first member (9) forming part of said intake body (2) and a second member (32) forming part of said drainage body (3) with one out of said first member and said second member having an elastomer seal (13) by means of which it comes into contact with said membrane (4), and in that said locking means (7, 31) are adapted to allow the opening of said device by requiring only a separation movement between said first member (9) and said second member (32), said locking means having means of axial latching (7, 31) between the intake body (2) and the drainage body (3), one out of the latter having at least one axially oriented latching tab (7) while the other has means of receiving (42, 44, 45) said latching tab, which extends projecting from the edge of a skirt (6) forming part of that one out of said intake body (2) and said drainage body (3) which includes it.

2. Device according to Claim 1, characterised in that the membrane (4) is held exclusively on account of it being gripped annularly at the periphery between said first member (9) and said second member (32).

3. Device according to either one of Claims 1 or 2, characterised in that said seal (13) is moulded on to that one out of said first member (9) and said second member (32) which includes it.

4. Device according to any one of Claims 1 to 3, characterised in that it is the first member (9) which has said elastomer seal (13).

5. Device according to Claim 4, characterised in that said first member (9) forms a lateral wall of said reservoir (5) of the intake body (2), said wall (9) finishing at one end in an edge forming part of said seal (13).



6. Device according to Claim 5, characterised in that a groove (14) is made at the end of a rigid part of said lateral wall (9) while said seal (13) has a T-shaped profile whose longitudinal branch forms a rib (50) inserted into said groove (14) and whose transverse branch forms a cushion (51) which is in  
5 contact with the membrane (4).

7. Device according to Claim 6, characterised in that there is a bevel (54) between the rib (50) and the cushion (51) on the external side, while, on the internal side, the rib (50) and the cushion (51) are connected by a straight surface.

10 8. Device according to either one of Claims 6 or 7, characterised in that said cushion (51) has two annular lips (53).

9. Device according to any one of Claims 1 to 8, characterised in that said latching tab is connected to the remainder of that one out of said intake body (2) and said drainage body (3) which includes it, by a breakable  
15 zone.

10. Device according to Claim 9, characterised in that said breakable zone is situated in the region of a dihedral (20) in one of the surfaces (19) of said latching tab (7).

11. Device according to Claim 10, characterised in that said surface  
20 (19) having a dihedral (20) is situated on the internal side of the latching tab (7).

12. Device according to any one of Claims 1 to 11, characterised in that that one out of said intake body (2) and said drainage body (3) which has means of receiving said latching tab (7) has a wall (42) oriented transversely and provided with an opening (44) through which the latching tab (7) can pass,  
25 means (23, 24, 45) being provided for preventing the withdrawal of the tab (7) once it has been pushed right into the opening (44).

13. Device according to Claim 12, characterised in that said means (23, 24, 25) for preventing the withdrawal of the latching tab (7) are provided on the latter and on said wall (42).

30 14. Device according to Claim 13, characterised in that said means for preventing the withdrawal of the latching tab (7) have, on said wall (42), a

tooth (45) oriented axially and bordering said opening and having, on said latching tab, a groove (23) adapted to accommodate said tooth (45).

15      15. Device according to any one of Claims 12 to 14, characterised in that said transversely oriented wall (42) is connected to a lateral wall (43) extending on the opposite side from that one out of said intake body (2) and said drainage body (3) which has the latching tab (7), with the dimension in the axial direction of said lateral wall (43) being greater than the dimension in the axial direction of the latching tab (7).

10      16. Device according to Claim 15, characterised in that a notch (46) is made in said lateral wall (46) at the level of said opening (44), to make it possible to press on said latching tab (7).

15      17. Device according to any one of Claims 1 to 16, characterised in that it is the intake body (2) which has the latching tab (7), and in that it is the drainage body (3) which has the means of receiving (42, 44, 45) said latching tab (7).

18. Device according to any one of Claims 1 to 17, characterised in that one out of said intake body (2) and said drainage body (3) has a number of said latching tabs (7).

20      19. Device according to Claim 18, characterised in that it has four latching tabs (7).

20. Device according to any one of Claims 1 to 19, characterised in that said locking means comprise exclusively said axial latching means (7, 31).

25      21. Device according to any one of Claims 1 to 20, characterised in that said drainage body (3) has a circular table (30) provided at its centre with means of supporting (48) said membrane (4) and having, around said support means (48), a wall (32) having a surface (33) situated facing said elastomer seal (13), which forms part of said intake body (2), said membrane (4) being squeezed between said surface (33) and said seal (13).

30      22. Device according to Claim 21, characterised in that said support means (48) have a concave surface facing said membrane (4).

23. Device according to Claim 22, characterised in that the ratio of the difference between the length of the arc corresponding to the profile, in a

diametral plane, of said surface of said support means (48) and between the length of the chord of this arc, over the latter length, corresponds to the coefficient of expansion of said membrane (4) between the dry state and the wet state.

5           24. Device according to any one of Claims 21 to 23, characterised in that said support means are formed by a porous pad (48).

          25. Device according to Claim 24, characterised in that said drainage body (3) has drainage channels (39) under said porous pad (48), said drainage channels opening into said output aperture (38).

10           26. Device according to any one of Claims 21 to 25, characterised in that the external diameter of said circular table (30) corresponds substantially to the internal diameter of a skirt (6) included in said intake body (2), said skirt (6) encircling said circular table (30).

          27. Device according to Claim 26, characterised in that areas of  
15 extra thickness for wedging (27) are provided between said circular table (30) and said skirt (6).

          28. Device according to any one of Claims 21 to 27, characterised in that said drainage body has a skirt (31) disposed in a step with respect to said circular table (30).

20           29. Device according to Claim 28, characterised in that said skirt (31) has means of latching (42, 44, 45) with said intake body (2).

          30. Device according to either one of Claims 28 or 29, characterised in that said skirt (31) of the drainage body (3) has at least one notch (47) adapted to allow the placing of a drainage syringe (64).

25           31. Device according to any one of Claims 1 to 30, characterised in that said output aperture (38) of the drainage body (3) is in the continuation of the internal passage of a coaxially disposed output pipe (37).

          32. Device according to Claim 31, characterised in that said drainage body (3) has, around said output pipe (37), an annular rib (40) tapering towards  
30 its end.

          33. Method for draining a device according to Claim 32, characterised in that it is placed on a vacuum flask (71) with said output pipe

(37) engaged in the central hole (75) of the stopper (74) of said flask and said annular rib (40) resting on this stopper.

New passage

Fig. 1

The invention relates to a device of the same kind, but simpler, more convenient and more economical, both in manufacture and in use.

To that end it proposes a device for microbiological examination of a sample of liquid under pressure, having an intake body, a filtering membrane and a drainage body, said intake body having a reservoir, in one wall of which a liquid input aperture is made, said membrane closing said reservoir, said drainage body having means of supporting said membrane on the opposite side from said reservoir and a liquid output aperture, said intake body and said drainage body having integrally moulded mutual locking means; characterised in that said membrane is gripped annularly at the periphery between a first member forming part of said intake body and a second member forming part of said drainage body with one out of said first member and said second member having an elastomer seal by means of which it comes into contact with said membrane, and in that said locking means are adapted to allow the opening of said device by requiring only a separation movement between said first member and said second member, <1.16> <<1.16>>

Thus, unlike the aforementioned earlier device, where the locking means are constituted by thread elements, the opening of the device according to the invention is performed with no rotational movement between the intake body and the drainage body.

The device according to the invention therefore makes it possible to eliminate any risk of creasing the membrane at the time of opening the device where it is then in the wet state.

Furthermore, the elastomer seal, although it is present only on one of the faces of the membrane, makes it possible to obtain sealing on both faces of the membrane, that is to say both with the first member and with the second member, from the simple fact that said members grip the membrane, that is to say they are held close to one another, so that it is not necessary, in order to close the device according to the invention, to perform a rotational movement, unlike the above-mentioned earlier device, which requires, so that the sealing lip on the intake body is applied with the required intensity on the drainage body, that assembly is carried out by screwing with a considerable torque.

The device according to the invention is therefore much simpler and more convenient to use than the above-mentioned earlier device<sup>F1.21</sup> and is furthermore simpler to manufacture, since there is no need, on the one hand, to make provision for achieving sealing between the membrane and the intake body by welding, and, on the other hand, sealing around the membrane between the intake body and the drainage body, given that, in the device according to the invention, the gripping of the membrane between the first member and the second member makes it possible to obtain these two instances of sealing directly.

10 Preferably, the membrane is held exclusively on account of it being gripped annularly at the periphery between said first member and said second member.

The manufacture and use of the device according to the invention are thus particularly simple, since no operation such as the sealing of the membrane existing in the earlier device has to be implemented, while, after opening of the device according to the invention, the membrane, which is fixed neither to the first member nor to the second member, can be recovered directly, for example with sterile tweezers in order to be put into culture in a conventional Petri dish.

20 ~~According to other preferred characteristics, said locking means have means of axial latching between the intake body and the drainage body, ——— the assembly of the device according to the invention is thus particularly simple, since it is sufficient to bring the intake body and the drainage body together in order to lock them by latching.~~

*Thanks to the fact that the*

25 It should be noted that the elastomer seal, on account of its elasticity, takes up the play necessary for enabling latching, so that, once assembled, the intake body and the drainage body are held with no axial play with respect to one another.

*is preferred* Preferably, for reasons of simplicity and convenience, both in manufacture and in use, ~~one out of said intake body and said drainage body~~ *the fact that the* has at least one axially oriented latching tab while the other has means of receiving said latching tab, *the*

there always remains, notably in the pad 48, a certain amount of the sampled liquid which mixes with the injected culture medium which is therefore diluted.

In variants, not depicted, it is the drainage body 3, and not the intake body 2, which has the elastomer seal such as the seal 13 described above; the male and female latching elements between the bodies 2 and 3 are provided respectively on the drainage body 3 and the intake body 2, rather than the reverse; and/or use is made of latching means of different type, locking means having hinge means between the bodies 2 and 3 and latching means opposite the hinge means, or means of locking other than by latching.

10 ~~Many other variants are possible depending on circumstances, and it should be stated in this respect that the invention is not limited to the examples described and depicted.~~

# CLAIMS

1. Device for microbiological examination of a sample of liquid under pressure, having an intake body, a filtering membrane and a drainage body, said intake body having a reservoir, in one wall of which a liquid input aperture  
 5 is made, said membrane closing said reservoir, said drainage body having means of supporting said membrane on the opposite side from said reservoir and a liquid output aperture, said intake body and said drainage body having integrally moulded mutual locking means; characterised in that said membrane (4) is gripped annularly at the periphery between a first member (9) forming part  
 10 of said intake body (2) and a second member (32) forming part of said drainage body (3) with one out of said first member and said second member having an elastomer seal (13) by means of which it comes into contact with said membrane (4), and in that said locking means (7, 31) are adapted to allow the opening of said device by requiring only a separation movement between said  
 15 first member (9) and said second member (32), <16> <<16>>

2. Device according to Claim 1, characterised in that the membrane (4) is held exclusively on account of it being gripped annularly at the periphery between said first member (9) and said second member (32).

3. Device according to either one of Claims 1 or 2, characterised in  
 20 that said seal (13) is moulded on to that one out of said first member (9) and said second member (32) which includes it.

4. Device according to any one of Claims 1 to 3, characterised in that it is the first member (9) which has said elastomer seal (13).

5. Device according to Claim 4, characterised in that said first  
 25 member (9) forms a lateral wall of said reservoir (5) of the intake body (2), said wall (9) finishing at one end in an edge forming part of said seal (13).

6. Device according to Claim 5, characterised in that a groove (14) is made at the end of a rigid part of said lateral wall (9) while said seal (13) has a T-shaped profile whose longitudinal branch forms a rib (50) inserted into said  
 30 groove (14) and whose transverse branch forms a cushion (51) which is in contact with the membrane (4).



7. Device according to Claim 6, characterised in that there is a bevel (54) between the rib (50) and the cushion (51) on the external side, while, on the internal side, the rib (50) and the cushion (51) are connected by a straight surface.

5 8. Device according to either one of Claims 6 or 7, characterised in that said cushion (51) has two annular lips (53).

~~9. Device according to any one of Claims 1 to 8, characterised in that said locking means have <sup>ing</sup> means of axial latching (7, 31) between the intake body (2) and the drainage body (3),~~

10 ~~10. Device according to Claim 9, characterised in that one out of said intake body (2) and said drainage body (3) has at least one axially oriented latching tab (7) while the other has means of receiving (42, 44, 45) said latching tab, which >~~ *the latter*

*(any one of 1 to 8)*  
11. Device according to Claim ~~10~~ <sup>9</sup> 11, characterised in that said latching tab is connected to the remainder of that one out of said intake body (2) and said drainage body (3) which includes it, by a breakable zone.

~~10 12.~~ Device according to Claim ~~11~~ <sup>9</sup> 11, characterised in that said breakable zone is situated in the region of a dihedral (20) in one of the surfaces (19) of said latching tab (7).

10 ~~11 13.~~ Device according to Claim ~~12~~ <sup>10</sup> 12, characterised in that said surface (19) having a dihedral (20) is situated on the internal side of the latching tab (7).

~~14. Device according to any one of Claims 10 to 13, characterised in that said latching tab (7) extends projecting from the edge of a skirt (6) forming part of that one out of said intake body (2) and said drainage body (3) which includes it. >>~~

25 ~~12 15.~~ Device according to Claim ~~14~~ <sup>(any one of 1 to 11)</sup> 14, characterised in that that one out of said intake body (2) and said drainage body (3) which has means of receiving said latching tab (7) has a wall (42) oriented transversely and provided with an opening (44) through which the latching tab (7) can pass, ~~said tab and said wall (42) having~~ <sup>(being provided)</sup> means (23, 24, 45) for preventing the withdrawal of the tab (7) once it has been pushed right into the opening (44).

13. Device according to claim 12, characterized in that said means (23, 24, 25) for preventing the withdrawal of the latching tab (7) are provided on the latter and on said wall (42).

- 14  
16. Device according to Claim ~~15~~<sup>13</sup>, characterised in that said means for preventing the withdrawal of the latching tab (7) have, on said wall (42), a tooth (45) oriented axially and bordering said opening and having, on said latching tab, a groove (23) adapted to accommodate said tooth (45).
- 5 ~~15~~<sup>17</sup>. Device according to ~~either one of Claims 15 or 16~~<sup>any one 12 to 14</sup>, characterised in that said transversely oriented wall (42) is connected to a lateral wall (43) extending on the opposite side from that one out of said intake body (2) and said drainage body (3) which has the latching tab (7), with the dimension in the axial direction of said lateral wall (43) being greater than the dimension in the
- 10 axial direction of the latching tab (7). ~~16~~<sup>15</sup> 18. Device according to Claim ~~17~~<sup>15</sup>, characterised in that a notch (46) is made in said lateral wall (46) at the level of said opening (44), to make it possible to press on said latching tab (7).
- 15 ~~17~~<sup>19</sup>. Device according to any one of Claims ~~16 to 18~~<sup>1 16</sup>, characterised in that it is the intake body (2) which has the latching tab (7), and in that it is the drainage body (3) which has the means of receiving (42, 44, 45) said latching tab (7). ~~18~~<sup>1 17</sup>
- 20 ~~20~~<sup>18</sup>. Device according to any one of Claims ~~18 to 19~~<sup>18</sup>, characterised in that one out of said intake body (2) and said drainage body (3) has a number of said latching tabs (7).
- ~~21~~<sup>18</sup> 21. Device according to Claim ~~20~~<sup>18</sup>, characterised in that it has four latching tabs (7).
- ~~22~~<sup>20</sup> 22. Device according to any one of Claims ~~20 to 21~~<sup>1 18</sup>, characterised in that said locking means comprise exclusively said axial latching means (7, 31).
- 25 ~~23~~<sup>21</sup> 23. Device according to any one of Claims ~~1 to 22~~<sup>20</sup>, characterised in that said drainage body (3) has a circular table (30) provided at its centre with means of supporting (48) said membrane (4) and having, around said support means (48), a wall (32) having a surface (33) situated facing said elastomer seal (13), which forms part of said intake body (2), said membrane (4) being
- 30 squeezed between said surface (33) and said seal (13). ~~24~~<sup>21</sup> 24. Device according to Claim ~~23~~<sup>21</sup>, characterised in that said support means (48) have a concave surface facing said membrane (4).

- 23  
25. Device according to Claim ~~24~~<sup>22</sup>, characterised in that the ratio of the difference between the length of the arc corresponding to the profile, in a diametral plane, of said surface of said support means (48) and between the length of the chord of this arc, over the latter length, corresponds to the coefficient of expansion of said membrane (4) between the dry state and the wet state.
- 24  
26. Device according to any one of Claims ~~23~~<sup>21</sup> to ~~25~~<sup>23</sup>, characterised in that said support means are formed by a porous pad (48).
- 25  
27. Device according to Claim ~~26~~<sup>24</sup>, characterised in that said drainage body (3) has drainage channels (39) under said porous pad (48), said drainage channels opening into said output aperture (38).
- 26  
28. Device according to any one of Claims ~~23~~<sup>24</sup> to ~~27~~<sup>25</sup>, characterised in that the external diameter of said circular table (30) corresponds substantially to the internal diameter of a skirt (6) included in said intake body (2), said skirt (6) encircling said circular table (30).
- 27  
29. Device according to Claim ~~28~~<sup>26</sup>, characterised in that areas of extra thickness for wedging (27) are provided between said circular table (30) and said skirt (6).
- 28  
30. Device according to any one of Claims ~~23~~<sup>21</sup> to ~~29~~<sup>27</sup>, characterised in that said drainage body has a skirt (31) disposed in a step with respect to said circular table (30).
- 29  
31. Device according to Claim ~~30~~<sup>28</sup>, characterised in that said skirt (31) has means of latching (42, 44, 45) with said intake body (2).
- 30  
32. Device according to either one of Claims ~~30~~<sup>28</sup> or ~~31~~<sup>29</sup>, characterised in that said skirt (31) of the drainage body (3) has at least one notch (47) adapted to allow the placing of a drainage syringe (64).
- 31  
33. Device according to any one of Claims 1 to ~~32~~<sup>30</sup>, characterised in that said output aperture (38) of the drainage body (3) is in the continuation of the internal passage of a coaxially disposed output pipe (37).
- 32  
34. Device according to Claim ~~33~~<sup>31</sup>, characterised in that said drainage body (3) has, around said output pipe (37), an annular rib (40) tapering towards its end.

33

32

~~35.~~ Method for draining a device according to Claim ~~34~~, characterised in that it is placed on a vacuum flask (71) with said output pipe (37) engaged in the central hole (75) of the stopper (74) of said flask and said annular rib (40) resting on this stopper.